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RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS.

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THIRTY-EIGHTH YEAR.

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RAILROAD GAZETTE

FRIDAY, JAN. 5, 1894

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Contributions.

The Interstate Commerce Commission Before the Courts.

WASHINGTON, D. C., Dec. 23, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the statement to be found on page 938 of your edition of this week in regard to the recent trial in St. Louis, in which I participated, I desire to say that it is *not* true that "Judge Phillips severely criticised the Interstate Commerce Commission and its attorneys for carelessness." On the contrary, Judge Phillips said that the technicality upon which the case turned was one which the attorneys could not have foreseen and for which they were not responsible. A. G. SAFFORD.

The Louisville & Jeffersonville Bridge.

The Phœnix Bridge Company,
PHŒNIXVILLE, Pa., Jan. 2, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We notice in your issue of Dec. 29, on page 941, where you give the plan of the falsework of the Louisville Bridge, that you figure the distance from top of cap to top of pile as 71 ft. 8 in., and show no bracing below the tops of these piles. You will see upon referring to the detailed plan of this falsework, on page 942, that this is not correct, as the X bracing runs down from the top of pile cap to the top of the lowest horizontal transverse brace. This oversight on your part may be the cause of some of the conclusions you have reached in regard to the failure of this falsework. You can further assure yourself in regard to this matter by referring to our detailed plans, which we sent you. THE PHŒNIX BRIDGE CO.

John Sterling Deans, Chief Engineer.

Ballast Unloaders.

CHAPLEAU, Ont., Nov. 30, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

My attention has been directed to an advertisement in your paper of the 10th inst. of the "Rapid Unloader." About two years ago while doing considerable trestle filling and plowing off cars with the locomotive, the idea of using a machine exactly as shown in the advertisement occurred to me and I made an effort to get one for our use, but after looking for a hoisting engine and drum of sufficient capacity, without success, and meeting with no encouragement to introduce what seemed to me a great saving of time, wear and tear on cars, etc.; I was obliged to abandon the idea. I should like to know when the "Rapid Unloader" was patented and how long it has been in use by the railroads named; for up to the time of seeing this advertisement I was not aware that such means of unloading ballast had ever been adopted.

I have, however, to take exception to the 20-cu. yds. as a car load. In 16 years' experience I have found that 7½ cu. yds. is a large average for 33 ft. cars loaded by steam shovel (pit measurement), and no flat car that I have ever seen carried more than 11 cu. yds. of sand or gravel hand-loaded. H. W. D. ARMSTRONG, *M. C. S. C. E.*

[We first described the Lidgerwood Rapid Unloader in the *Railroad Gazette* Oct. 7, 1892. At that time Mr. Swift, of the Delaware & Hudson, spoke of having used it in 1890 and 1891. Therefore, Mr. Armstrong's idea seems to have been anticipated, as so often happens with other men's good ideas. The cubic capacity of a car 35 ft. over all, with 10-in. sideboards, is a matter of easy figuring.—EDITOR RAILROAD GAZETTE.]

The Uses of Cattle-Guards.

Burma State Railway,
INSEIN, Burma, Nov. 11, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Reading your valuable journal weekly I note the large nember of advertisements of "cattle-guards" of all kinds made by various manufacturers. Would some one say to what extent these contrivances are employed on American railways? And what is their exact object and purpose? Are they used for protecting the approach to bridges? In this country we have serious accidents, occasionally, owing to cattle getting on to bridges. In such cases the cattle-fender of the engine fails to throw them clear of the track, as their legs get caught in the open spaces between the sleepers. Anything to prevent such accidents would be welcomed. LOCO.

[Cattle-guards are universally used on American railroads. Their exact object is to prevent cattle which must cross the track at highways or other proper crossings, from turning one way or the other at the crossing and following the track. We do not know that they are ever used for the special purpose of keeping cattle off bridges, but in theory they are so placed that cattle will not go on the track anywhere except to cross it. They are of two types, the pit guard and the surface guard. The pit guard is an opening in the roadway over which the track is carried on stringers. In the surface guard the roadway and usual ties are left intact, and the guard is simply a contrivance placed on the top of the ties designed to prevent the passage of cattle. Theoretically, the surface guard is much preferable, as there is no interruption of the continuity of the track; also because with the pit guard there is danger of cattle falling and getting caught and remaining there to derail a train. Practically, the surface guard, although very extensively used and generally much preferred by American engineers, does not seem to be absolutely efficient for it is difficult to so contrive such a guard that cattle will not cross it when scared; yet even a pit-guard will not stop frightened stock, and under ordinary circumstances, the surface guards in common use protect the track very well.—EDITOR RAILROAD GAZETTE.]

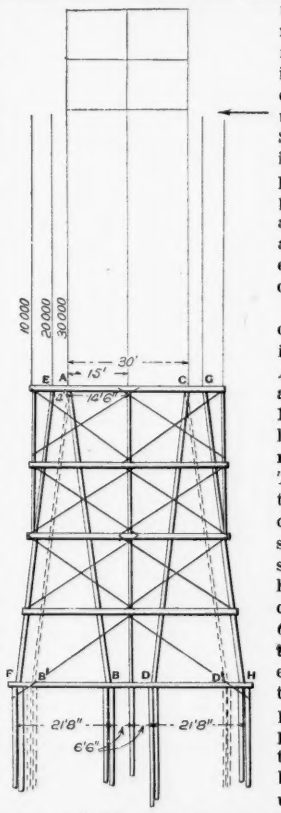
The Stability of Falseworks.

18 BROADWAY, New York, Dec. 29, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wish to call attention to the arrangement of falsework bents of the Louisville & Jeffersonville Bridge, not for the purpose of entering upon a general discussion of the causes of the recent calamity, but for the reason that it is similar to a type which should be used with more caution than is frequently the case in trestlework.

The accompanying diagram of a bent, copied from one of the cuts in the *Railroad Gazette* of 29th inst., shows the four posts so arranged as to approximate to the form of an inverted M. There are cases when this form may be quite effective. Such would be the case if the load to be supported was low in proportion to its width above the falsework, and the upper ends of each pair of posts were close together.



Referring to the accompanying diagram, it will be seen that posts *AB* and *CD* are 29 ft. apart at their tops, and 13 ft. apart at their lower ends where they rest upon pile caps. These posts have to sustain all of the weight of a panel of the superstructure, excepting such portion as the horizontal timbers *EG* can transmit to *EF* and *GH*; hence their position is one of unstable equilibrium in proportion as *B* and *D* approach the middle point. They would sustain a strictly vertical load, resting equally upon *A* and *C*. But when a wind is acting transversely upon the superstructure in the direction of the arrow, and that superstructure is very high compared to its width, a very considerable portion of the weight may be transferred from *C* to *A*. *AB*, which should receive this weight, inclines in such a direction that its horizontal componant acts in the direction of the wind and has nothing to resist it except by tranmission to *EF*. As very little of this increased weight can be transmitted to *EF*, here is great danger of its overturning the falsework. Besides *EF* has at the same time an increased load produced by the wind's action upon the traveler. Had *AB* and *CD* been respectively placed in the positions AB^1 and CD^1, and each supported by two piles directly under them, they would have been in a position to resist the action of the wind, as well as to sustain the vertical load. In other words, if you would have stability, widen the base instead of making it narrower.

L. L. BUCK.

The Von Borries System of Compounding Locomotives.

HANNOVER, Dec. 15, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the issue of your valuable paper of Dec. 1, 1893, I find a letter signed Hope & Co., wherein an attempt is made to demonstrate that the classification of compound locomotives as contained in my paper read before the Engineering Congress at Chicago is incorrect. This demonstration is based on an *abstract* of that paper, which seems to have been very incomplete. If Messrs. Hope & Co. had read the paper itself they would have found an answer to every question they raise in their letter, especially that I have really classified all the locomotives with Lindner's or similar starting geer under the Worsdell-von Borries system. They would also have found the reasons for this classification, which unfortunately seem to have been omitted in their "abstract."

I do not want to tire your readers with a repetition of those reasons, because most of them will have read my paper completely and settled their opinion on the matter. I only beg to state that I brought out and published as my system, in 1880, an invariable two-cylinder compound locomotive which only starts with live steam in both cylinders, and automatically changes to compound working soon after starting. This principle I have brought forward in distinction from the Mallet system, which can be worked compound or non-compound at the will of the engineer, but I did not claim or bring forward special principles for starting devices, which I have tried to improve according to experience.

After the economical results of my compound locomotive became public in Germany, Mr. Lindner and other inventors followed exactly the same principles, using partly the same devices, which I had then abandoned as imperfect. This is especially the case in Mr. Lindner's device, whose four-way cock, which is the proper starter, is worked exactly in the same manner by the reverse-lever as my slide valve, patented in 1880, the only difference being that his valve face is round and mine was flat.

Because of these facts, which are fully demonstrated in my paper, I believe my classification to be correct. This statement cannot be altered by Mr. Mallet's device of an intercepting valve, which came to my knowledge only in 1893, because he never has used such valve, but always kept up the changeable arrangement as his system. Every inventor who has studied this matter thoroughly will be able to show you a number of different starting and changing devices which have never been tried. Only those who have first successfully introduced certain principles into practice seem to be entitled to claim that their construction should be called a system.

Messrs. Hope & Co.'s proposition for another classification, in which Mr. Lindner's device would appear as a system, does not agree with the well-known facts in the history of the compound locomotive. Also, their suggestion that I had ignored Mr. Lindner's device is incorrect, this being mentioned together with other starting devices based on the same principles on page 11 of my paper.

Altogether, Messrs. Hope & Co.'s suggestions are superficial and incorrect in the essential points. If these gentlemen wanted to bring to the minds of your readers the "ingenious and successful" device of Mr. Lindner this would have been done better without undue attacks on other people.

For myself I do not care much about classification at all, but only wish to improve the locomotive engine, as my numerous American friends know well enough. For this reason I am now introducing for heavy compound locomotives a very simple and effective change-valve that goes under the Mallet system. This valve is just now tried on an express engine of the Saxon state railroad, because Mr. Lindner's "successful device" has proved there unsuccessful for starting heavy passenger trains with the necessary promptness.

VON BORRIES.

Track Laid in 1893.

The total amount of new track reported to us as built in the year 1893 is 2,585 miles, in the United States, and 435 miles in Canada. The detailed list, showing what companies have been engaged in this new construction work, will be published in a subsequent issue. The following table gives a recapitulation of the new mileage by States:

Alabama	47.5	New Mexico	2.6
Arizona	43.8	New York	35.2
Arkansas	43.9	North Carolina	89.3
California	68 1	North Dakota	206.4
Colorado	37.1	Ohio	140.8
Florida	170.3	Oregon	15. 0
Georgia	168.5	Pennsylvania	313.2
Idaho	5 6	Rhode Island	5.2
Illinois	85.3	South Carolina	8.0
Indiana	44.9	South Dakota	102.2
Iowa	4.0	Tennessee	26.6
Kansas	18 4	Texas	198.4
Kentucky	28.6	Utah	16.0
Louisiana	10.8	Virginia	16.8
Maine	119.2	Washington	45.5
Maryland	2.0	West Virginia	77.3
Massachusetts	1.6	Wisconsin	29.5
Michigan	61 0	Wyoming	4.0
Minnesota	85.1		
Mississippi	9 5	Total, United States	2,585.5
Missouri	129.5	Canada	435.2
Montana	27.0	Mexico	9.0
Nebraska	32 6		
New Hampshire	1.0	Grand Total	3,024.7
New Jersey	2.0		

The per cent. of the total as divided among the differ-

ent groups, for each of the past five years is shown in the appended table:

	1889.	1890.	1891.	1892.	1893.
Northeastern states	36	34	33	16.4	32.2
Southeastern states	24	18	23	34.5	21.2
Southwestern states	10	21	15	17.8	19.8
Northwestern states	18	18	18	18.4	18.3
Pacific states	12	9	11	12.9	5.5
	100	100	100	100	100

In previous years the length of new track laid after July 1 has generally been about twice that laid in the first half of the year, but in 1893, owing to the unusual financial conditions, the last half shows only about 50 per cent. more miles than the first half.

Some Consideration of Passenger Car Framing Suggested by Recent Collisions.

The superintendents of motive power, the master mechanics and the master car builders, who have been congratulating themselves on the fact that not a single wreck of any great magnitude occurred—primarily on account of defects in rolling stock—during the World's Fair season, have yet to deplore the loss of life which actually resulted from defects in passenger cars, for the loss of life would have been much reduced if the equipment had all been in accord with the best practice so far as strength is concerned. For instance, if the car sills had been well tied together and the floors made double and laid diagonally, and the vestibule end put on, there would probably not have been a single case of telescoping. Some railroad men go so far as to say that they have never known a case of telescoping where the vestibule was used. The failure to provide cars with these safety devices cannot be excused on the score of cost, as the extra expense of the double diagonal floor and crossties for sills is very little, and competition has already reduced the cost of the vestibule to a point within the means of any railroad. The total expense is so small as to disappearwhen compared with the cost in money, worry and loss of traffic resulting from any one of the several recent large wrecks. To some roads the value of strong equipment in increased passenger business, if the fact was well known to the public, would greatly overbalance the increased cost, just as the use of Pintsch gas, and in some cases the electric light, and steam heat in the place of the oil lamp and the stove, has been shown to be warranted by the fact that passenger agents have been enabled to gather an increase of traffic. There is then no logical reason for building comparatively weak cars on the score of economy.

Where the responsibility of a Superintendent of Motive Power, a Master Car Builder or Master Mechanic generally begins and ends it is impossible to conclude, as much depends upon the relation between these officers and the higher officers of the road. At the November meeting of the Western Railway Club there was some interesting discussion on this point. One fact that perhaps is quite sufficient to show that the higher officers have a full appreciation of the value of strong underframes is found in the description of some officers' cars recently built which was given by one of the members. It was said that the floor of the cars was made of sill timbers laid side by side close together for the entire width; over this was laid a double diagonal floor, and the sides were strengthened in proportion by making them solid the thickness of the posts up to the windows, with a liberal addition of 2-in. planking. We do not know for whom these cars were built, but it would be interesting to learn whether the day coaches on the same road were provided with any of the modern appliances for increased strength of framing to give greater protection to passengers.

One member of the Western Railway Club thought that the loss of life in recent wrecks and the unfortunate, but not surprising, complete demolition of the day coaches, were due to running of stronger cars, such as sleepers and chair cars in the same train, and some persons have gone so far as to say that safety to passengers in coaches can only be gained by running the sleepers in separate trains. Probably those who hold this opinion have not stopped to think how much greater would have been the disasters if the locomotives had struck the day coaches directly, in a rear collision, without the interposition of the stronger sleepers. It cannot be disputed that anything having weight, and therefore inertia, that is placed between coaches in a train and the oncoming locomotive, will reduce the effects of the shock on the coaches. Manifestly the greatest damage is produced at the point of impact, and if the sleepers were no stronger than the coaches, they would themselves be badly broken up and the coaches be less injured. It is folly to talk about the sleepers being "battering rams" which demolish the coaches in rear collisions, for this would only be true if the coaches had no weight and therefore

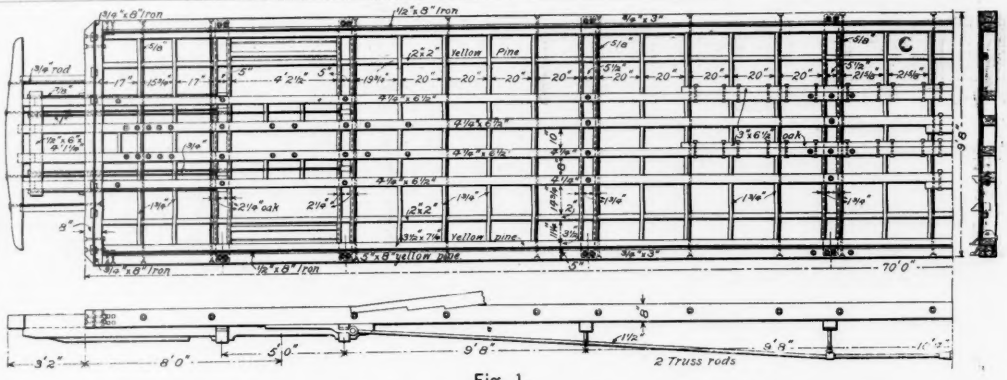
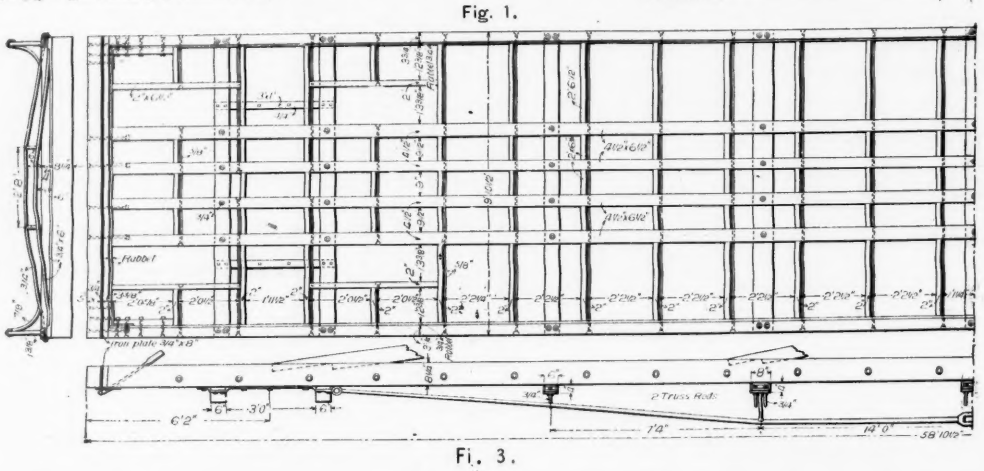


Fig. 1.



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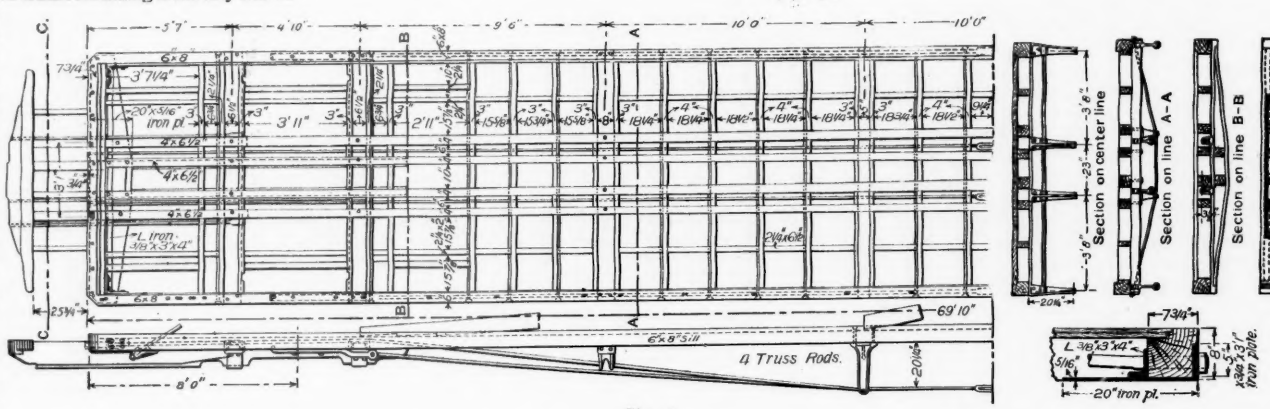


Fig. 4.

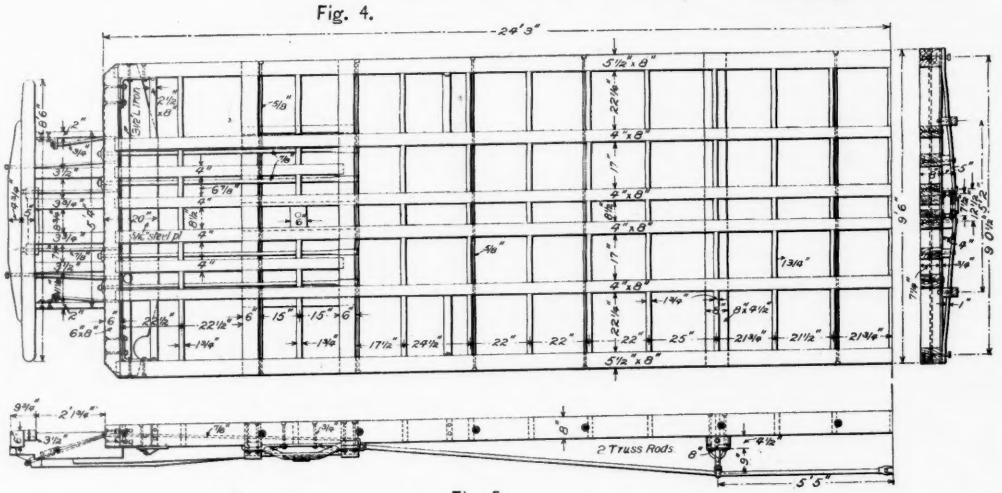


Fig. 5.

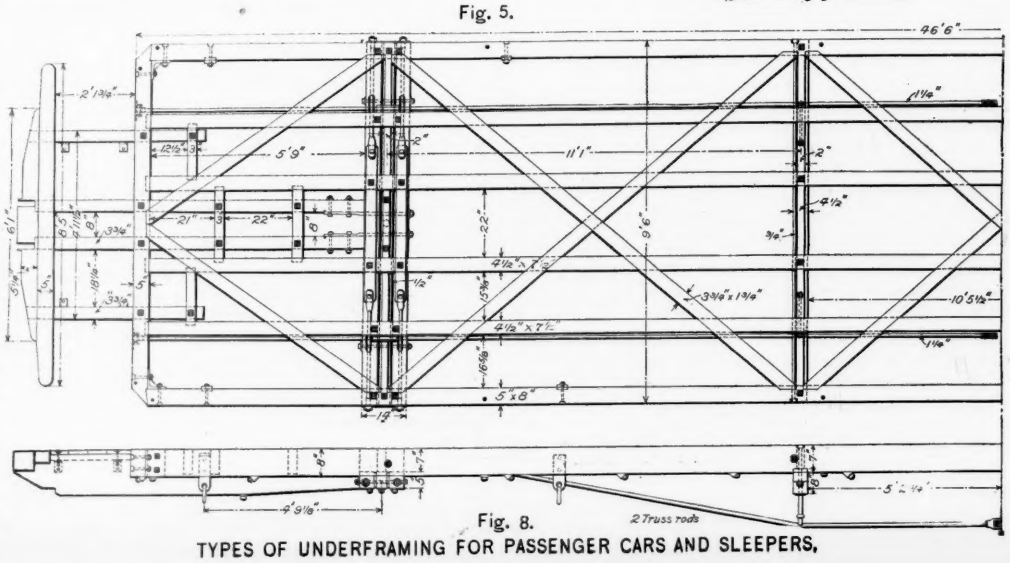


Fig. 8.

TYPES OF UNDERFRAMING FOR PASSENGER CARS AND SLEEPERS.

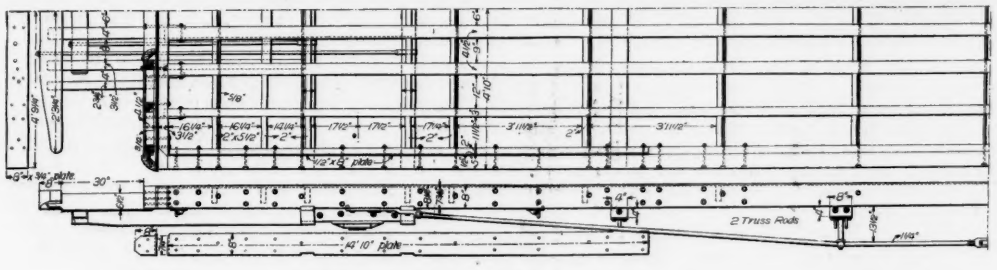


Fig. 2.

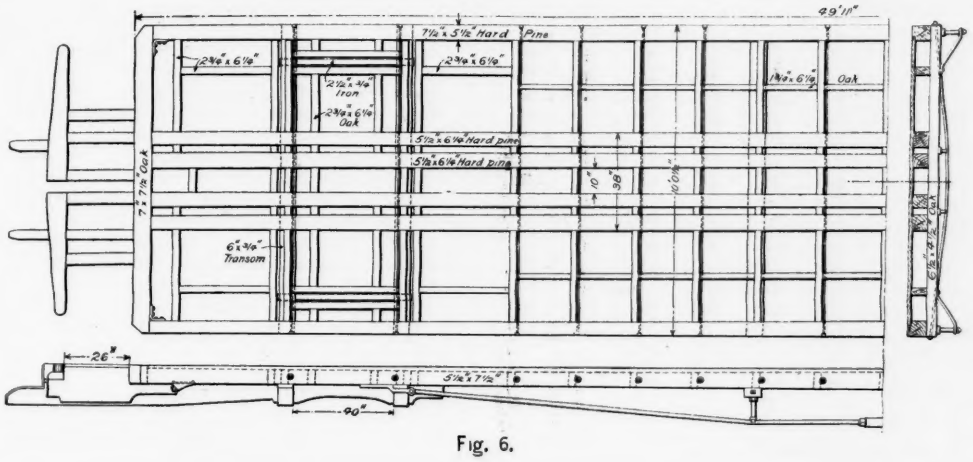


Fig. 6.

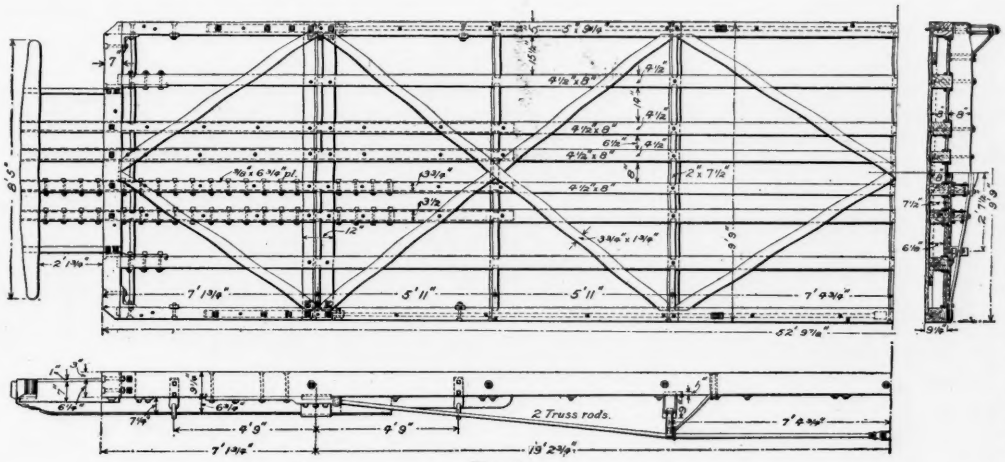


Fig. 7.

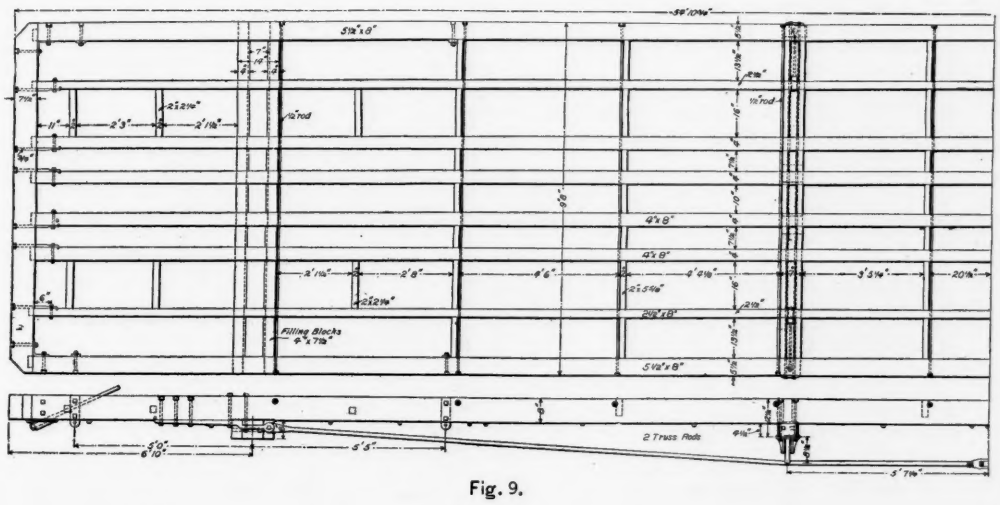


Fig. 9.

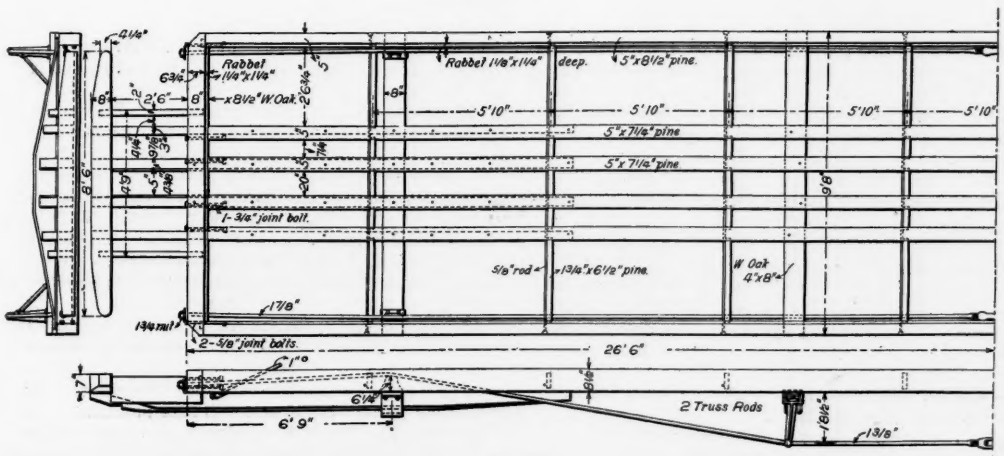


Fig. 10.

TYPES OF UNDERFRAMING FOR PASSENGER CARS AND SLEEPERS.

no inertia. On this point the questions have been asked: "What will become of the shock if the cars were of equal strength and all were as strong as the sleepers? Is it not a fact that something must be smashed in order to absorb the shock?" The reply is that in theoretical mechanics, where theoretical bodies are dealt with and masses are assumed to have no elasticity and are absolutely rigid, the conclusion is reached that if two of these theoretical inelastic bodies come together, even at so low a speed as one mile an hour, both bodies will be pulverized. But in practical mechanics we all know that there are no rigid and inelastic bodies, and the shock is absorbed first by the elasticity of the framing of the sills, in the case of cars, and on the rebound the cars move backward and the stored energy is finally absorbed in the friction of the wheels and axles and other resistances to motion and disappears in the form of heat distributed over such large masses of material as to be imperceptible. Just as it is possible to have a collision at a minor speed between coaches and sleepers without disaster to each, so it is possible to have a more severe collision at higher speeds between the stronger sleepers themselves, or between coaches and sleepers which are equally strong, without damage to either. In case of the officers' car mentioned no doubt a collision could be resisted without damage at speeds higher than that at which any collision has occurred during the whole World's Fair traffic season. Given the weight of the cars and the speed at the collision, it is not a difficult matter to design cars that will withstand it. There is no better material to resist heavy impact than wood and there is no better way of placing wood to resist heavy impact than by placing it endwise to the direction of collision just as car sills are placed, and it is only necessary to use enough timber in the sills, to tie them together laterally with sufficient bolts or plates and to keep them in line, in order to prevent undue smashing. So far as can be seen now, the vestibule, or perhaps the Blackstone buffer, is sufficient to keep the sills in line or at least to prevent telescoping. It has been clearly shown that the Miller platform no longer answers to prevent the sills from riding one above the other and preventing telescoping.

The principles of the theory of car framing, so far as a prevention of undue fracture and telescoping in the case of wrecks is concerned, are simple. The sills must be set in line and they must be strong enough to resist the shock. It is hardly necessary to ask further that the roofs should be tied on and the sides be so braced that they will not be thrown off and fall apart, like the parts of a cheap trunk in the hands of a "baggage smasher," as has been the case in some of the recent collisions. The weakness of some designs of car framing will perhaps be better appreciated by preference to the accompanying cuts and those shown in the Car Builders Dictionary. As pointed out by Mr. Peck at the Western Railway Club, the construction in some cases is surprisingly weak. A ⅞-in. floor is often the strongest part which ties the sills together, and the end sills are frequently so much cut away that the resisting power is practically nothing in a collision. The weakness of platforms, more particularly of the older type without vestibule, have become proverbial.

The following is a brief description of the illustrations: Figs. 1 and 2 are of the composite type and are in use on cars of the Lake Shore & Michigan Southern, the New York Central and the Wagner Palace Car. The side sills are an iron or steel web plate bolted between. In fig. 1 this plate is continuous throughout the length of the car and is bolted through and through.

The side sills are strengthened by a heavy combination queen post truss. The rectangular holes at the end sill are to receive the iron bars of the composite end posts. There is a cross timber underneath the platform to receive the platform end sill bolts. The manner of splicing the center sills is shown in fig. 1.

Fig. 2 is also a composite type of framing adapted to standard passenger construction. A short plate is employed extending 7½ ft. on both sides of the truck center, stiffening the sill for that distance and acting as a cantilever for the overhang of the sill; it is turned at the end sill forming the sill knee-iron It has the heavy composite end sill of fig. 1, made up of two pieces of timber and a ¾ × 8 in. iron plate. The tinuous outer-intermediate sill (3 × 7⅞) throughout the length of the car, a feature found also in figs. 7 and 9. This long sill gives greater sectional area to resist the shocks of collisions and compensates in a small degree for the weak side framing of the car, which consists only of a 2¼ × 12 in. plank placed on edge, and con nected to the side sill with short vertical tie-rods. The New York Central uses a 4 × 8 outer intermediate sill, and strengthens its side sills with the ordinary Howe truss, besides using the plank on edge. The side sills of fig. 2 are stiffened by 2½ × 8⅝ planking securely bolted to the side, which give practically a double side sill. The car is stiffened laterally by a layer of flooring laid diagonally, which is covered by a second layer laid lengthwise with the car.

Fig. 3 represents the underframing of a 59-ft. car built on an early plan of sleeping car. The end sill has an iron plate, and the longitudinal sills are close together. The side sills are trussed with the Wagner compound queen post truss and further stiffened by a solid plank 2½ × 12 in. on edge, with tie-bolts to sill. The outside is planked with 1-in. plank.

Fig. 4 shows the most recent underframing of the

Pullman Palace Car Co., and is called the "Session plan." There are a great number of bridgings and sill tie-irons. At the end of the car is shown the patent end framing, shown in detail at the right. It consists of a $\frac{5}{16}$-in. plate, 20 in. wide and tapering to the sides. This plate is bolted to the under side of the end sill and to the ends of the long sills. To it and the inner side of the end sill there is riveted and bolted an angle-iron $\frac{5}{8} \times 3 \times 4$ in. The intermediate truss rods pass over the body bolster, through this angle iron and to a heavy plate on the outer face of the end sill. The strength of this combination of boiler plate and angle-iron, with a $7\frac{3}{4} \times 8$ oak end sill, is very great and is well calculated to distribute the force of shocks over the entire sill area. The draft timbers are carried 12 ft. back upon the center sills and the platform timbers are in a direct line with the inner sills. The flooring is let into the side and end sills by a double rabbet, and the two thicknesses are laid diagonally and in opposite directions.

Fig. 5 is a modified type of fig. 4, the chief difference being in the spacing of the center and intermediate sills. It has the same style of end and side framing, but the sills have been placed farther apart.

Fig. 6 is a 50-ft. car and an extreme case of sill bunching. Tha center sills are 10 in. apart, and the intermediate sills but 3 in. from the center sills. This arrangement is to back up the Blackstone coupling and buffing device. An auxiliary coupler is placed directly over the ordinary drawbar, and fastened to the end sill with draft and buffer springs on either side of it. This device requires that a piece be cut out of the platform end sill in the middle. A so-called "anti-telescoping" device is another feature of this car framing. It consists of projecting platform timbers so staggered that the timbers of one car project under the platform of the next car to which it is coupled. It is to prevent one car from rising up over the other as in telescoping. It is also intended to make the train ride more smoothly. Described in *Railroad Gazette* 1892, p. 526.) In this design the sills are scarcely tied together at all, except by the flooring.

Fig. 7 shows an unusually heavy underframing. The most noticeable feature is the introduction of an auxiliary or outer-intermediate sill ($4\frac{1}{4} \times 8$ in.) which is the same size as the inner-intermediate sills. This is a good step in underframing, and more so as there is a $\frac{3}{4} \times 8$ in. end plate (not shown). The four center sills are re-enforced at each end by heavy draft and platform timbers that extend 16 ft. under the car. They are plated with $\frac{3}{8} \times 6\frac{3}{4}$ in. steel and are bolted through and through to the sills with which they are in direct line. The end sill is plated with $\frac{3}{4} \times 8$ iron (omitted in figure). A body bolster is used which does not weaken the sills or timbers. The car is stiffened laterally by intermediate bridging joists, sill tie-rods and diagonal floor bracing, and by two thicknesses of flooring laid diagonally in opposite directions. Altogether it is an unusually heavy type of underframing, and if the vestibule is used or an iron end framing for the top of the car, the design is beyond criticism at present.

Fig. 8 illustrates a type of framing from which fig. 7 has been developed. Its weakness is too apparent to require pointing out. It is given to illustrate an instance of the marked improvement which has taken place in car framing during the past few years. Such cars as these should have end plates and double floors added when in the shop for repairs.

Fig. 9 illustrates a type of framing with an outer intermediate sill $2\frac{1}{2} \times 8$ in. The sills are so placed as to be in line with the draft and platform timbers. The end sill is $7\frac{1}{2} \times 8$ in., without plate or angle-iron. Lateral stiffness is derived from the floor alone. The design is weak and should be classed with fig. 8.

Fig. 10 shows an ordinary type of framing for short coaches and must be considered weak. The car is 53 ft. long. The underframing alone is perhaps as heavy as is usual, but it has not anything like the necessary stiffness and strength. The end sill is $8 \times 8\frac{1}{2}$ in., white oak, without plates or knee angle irons. For lateral strength this car must depend upon the flooring.

The strongest of all these framings is the type shown in figs. 4 and 5, in which a horizontal plate is used to tie the sills together, more particularly as this is generally used with the vestibule and with a heavy iron post and carlines for the end of the car. Next in order of strength come figs. 1, 2, 3 and 7, in which an iron bumper plate is used to prevent the spreading of the sills. The design shown by fig. 6 is especially weak in lateral strength, but has the advantage of the projecting sills to prevent one platform rising above the other. This last, however, is limited entirely by the strength of the platforms which are notoriously weak on all cars, excepting, perhaps, on those having a vestibule. This scheme of projecting the end sills to form an anti-telescoping device is not, in any form in which it has yet been built, the equivalent of the vestibule in preventing telescoping. Designs shown by figs. 8 to 10 are weak and inadequate, in that they have no substantial lateral ties for the sills. The additional cost of the better construction shown in figs. 1 to 5 and 7 is about $25 per car, altogether too small an amount to make the additional cost any excuse for its omission.

The lesson of the weakness of cars is one of the most useful of all these taught by the recent collisions, for it is evident that had the cars been of the best modern design, or had they been of the old designs and strengthened by plates which are easily put on in any repair shop, the loss of life would have been much less. It cannot be argued that the modern constructions with double diagonal floors and end plates materially increase the total weight of the cars and therefore are an objection, for the reason that the difference in weight brought about by these improvements is much less than the difference in the weight of coaches built on different plans otherwise and without these improvements. Altogether this subject which has been brought up by the past season's experience with dense traffic, and by Mr. Gibbs' paper on the exhibition of passenger cars at the World's Fair, before the Western Railway Club in November, is sufficiently important to make it worth while for the higher officers of railroads to investigate the details of the present coach equipment and to examine carefully specifications for new cars.

A Yard for Handling 1,000 Cars a Day.

BY W. S. SCOTT.

Most freightyards were originally laid out of a size to accommodate the business, and as the business increased tracks were added here and there, the result being that to-day some of the large yards are simply a collection of tracks on which it is almost impossible to classify trains with any degree of promptness or convenience. The proper design of yard, both with a view to quick movement and inexpensive operation, has been largely sought after.

The accompanying plan is offered as a contribution to this subject. Trains can be classified either by gravity or by "poling." If a grade of 0.6 per cent. (31 ft. per mile) can be obtained the gravity plan is superior to the poling, as trains can be drilled in one-third the time otherwise required.

In drilling trains by either method 80 cuts a day (12 hours) for a car dropper is a fair day's work. To handle 1,000 cars a day—equal to receiving and forwarding 25 to 30 trains of 30 cars each, taking the eastbound and westbound business together—the receiving yard (*A*) should not have less than eight tracks, the first track to hold two full trains. The classification yard (*B* should be large enough to make the different classifications without crowding.

If we make 18 classifications, the track assigned for the largest volume of freight should have a capacity of 90 cars. The tracks not being of the same length the shorter tracks can be used for local cars.

The tracks should be straight. The grade from the receiving yard to the classification yard should not be less than 0.6 per cent. In the classification yard 0.4 per cent. is sufficient. The switches should be connected to levers in a tower (*I*) situated about the middle of the ladder track. Rod connections are good, but it is better to use Westinghouse's pneumatic system (non-interlocking) with no signals. As it is very difficult for a switchman at night to see when cars are beyond the fouling points, he should be able to throw any switch instantaneously.

The yard should be lighted by electric lights and have a complete system of telephones, in addition to the telegraph.

In drilling trains, shop cars should be run over as few switches as possible. The heaviest work should be done on the first set of switches, as then the car droppers do not have so far to walk. One track should be set apart in the receiving yard for road and yard engines to return on from the east end of the yard to the west end. Track (*L*) in the classification yard is for the "pick up engine," which carries back to the train the brakemen who ride the cars down.

The roundhouse, situated at the west end of the yard is easily accessible, as road engines, both from east and west, uncouple from their trains at that end. Machine shops should be located close to the roundhouse for necessary repairs to engines. The ash pit should be of sufficient length to hold four engines at one time, and should be so built that the cinder can be easily cleaned out of it. There should be a coal tipple so situated as to be easily accessible both to the road engines and the yard engines. The water plugs should be close by.

The car repair shops should be at the east end of the yard, so that the grade will be toward the shops. Shop cars can then easily be cut out of trains from the classification yard. After cars have been repaired they can be taken to the west end of the yard, by tracks (*K*), leading from shop, and then be placed on poling track to be classified. A yard at the east end (*E*), and connected with the classification yard, should be provided, to be used either for made-up trains or to store freight.

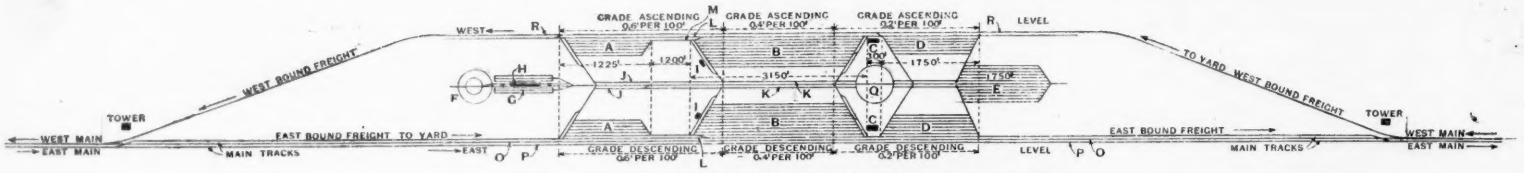
Operation of the Yard.—A train arriving from the west will pull into the receiving yard (*A*). The flagman cuts the cabin off, and, if the track is clear, drops the cabin to the caboose track (*J*). The engine will cut loose from the train and return to west end of yard by track *L*. If the cabin has not already been put away the engine will place it on the west end of the caboose track and then go to ash pit (*H*). The conductor will leave the manifests for his train at the yard clerk's office at the east end of the receiving yard, where a record should be taken of the train. The car inspector will inspect the train, doing any small jobs, such as repairs to brakes, etc. The conductor of the yard crew in the receiving yard will mark on the side of each car the track for which it belongs in the classification yard, and either tack (the manifests on the sides of the cars) or else send them to the yardmaster at the lower end of the yard, at the same time making out a switch list for use of switchman, showing the number of cars in each cut and the track on which the cars belong in the classification yard. The train is then ready to be placed on the poling track to be classified by the poling crew. The manifests, if they have not been tacked on sides of cars, are sent down with brakeman on the front end of the train, who gives them to the conductor of the poling crew or to the engineer of "pick up" engine, who gives them to the yardmaster at east end of yard. It is the better plan to tack manifests on the cars, as in case the chalk marks become obliterated the cutter can tell by manifests where to cut.

The force necessary to operate the yard 12 hours by poling is as follows: One general yardmaster, two assistant yardmasters, eight switchtenders, two engines (one east and one west bound) to place trains on poling tracks each with a conductor and three brakemen. Two engines to pole cars (one east and one west bound), each with one conductor, one cutter, one poler and 15 brakemen; two engines to pick up brakemen, one engine at east end of east and west bound classification yard to make up trains, conductor and three brakemen.

To drill by gravity, instead of having a crew in receiving yard, there should be two engines with one crew for the two engines, as follows: A conductor, one assistant conductor (to mark trains), one cutter and 15 brakemen. The poling track should be not less than 1,200 ft. long. The train is marked the same as in poling. One of the engines will get behind the train, and as many brakemen will mount the train as there are cuts. The train should be started slowly, so as to allow the brakemen on the first cuts sufficient room to space the cars. If the train is properly handled there should be no necessity of the engine stopping until the last car in the train is put away. The other engine in the mean time is getting the next train ready with the balance of the crew, and, as soon as the first engine clears the poling track (returning to receiving yard by running track (*L*), will be ready to start the second train.

In drilling with a descending grade the limit of work that can be done is dependent entirely on the force of car droppers. This is why a pick-up engine should be used. If the car droppers have to walk back from the classification yard to the poling track, the poling engine will be idle a large part of the time. With a descending grade from .1 per cent. to an ascending grade of .2 per cent., the rapidity of the work depends almost entirely on the speed of the engine, as it has to travel so much farther to give the cars a sufficient start.

In dispatching an eastbound train, the engine coming from the roundhouse on track between tracks *J* and *K* stops at the east end of the caboose track for its cabin If the crews run first-in-first-out the cabin should be the first on the track. The engine will then proceed to east end of the yard. There the conductor will report to the yardmaster, and get his instructions as to where to get his train.



PLAN FOR A YARD TO HANDLE 1,000 FREIGHT CARS A DAY.

A. A. Receiving yard E. and W. B. B. Classification yard E. and W. C. C. Yardmaster's office E. and W. D. D. Yard for made up trains E. and W. E. Yard for shop cars. F. Roundhouse. G. Coal tipple. H. Ash pit and water plug. I. I. Switch tower E. and W. J. J. Caboose track E. and W. K. K. Running track E. and W. shop cars repaired. L. L. Running track, E. and W., classification engine. M. Poling track (same on other side of yard). O. O. Westbound main track. P. P. Eastbound main track. Q. Car Repair shop. R. R. Westbound freight track.

The drilling and dispatching of westbound trains is practically the same as with eastbound, except that westbound trains are pulled up the main track and backed into the receiving yard. In forwarding a train the crew will either get cars out of yard *D* or the yard crew at this point will catch the cabin and pull the train out of classification into yard *D*, where the road crew can couple on and pull out on to main westbound freight track (*B*).

A complete record should be kept of all movements made in the yard, also the date and hour of arrival and departure of all cars, including number, initials, consignee, point of shipment and final destination, so that in case a manifest should be mislaid it can easily be duplicated.

In drilling either by gravity or poling, if you handle from 350 to 400 cars a day, an average of 15 to 20 cars per month will be damaged owing to bad brakes, etc. With 18 classifications and 30 cars to a train, the cuts will average about 2 to 2½ cars each.

If necessary, a scale track can be placed on the poling track (*M*), close to the west end of the classification yard.

Iron Ore Traffic.

The *Iron Trade Review* and the *Marine Review* both give the following tables showing the movement of iron ore on the upper lakes.

LAKE SHIPMENTS OF IRON ORE, GROSS TONS.

	1893.	1892.	1891.	1890.
Escanaba	2,048,981	4,010,085	3,058,590	3,714,662
Marquette	1,043,988	1,026,338	1,056,027	1,307,395
Ashland	1,117,520	2,223,683	1,261,658	2,123,556
Two Harbors	902,352	1,165,076	890,299	826,063
Gladstone	203,343	115,886	177,866	91,091
Superior	80,273	4,245	.....	.....
Duluth	440,292	.....	.....	.....
Total by lake	5,836,749	8,545,313	6,444,440	8,063,067
Total all-rail	.....	528,930	650,541	940,634
Total shipments	.....	9,074,243	7,094,981	9,003,701

The shipments from Duluth and Superior, 520,565 tons, or nearly 10 per cent. of the total lake shipments will immediately command attention, as will the virtual cutting in two of the shipments from Escanaba, which is still the largest shipping port on the lakes, but is not up to the business in Ashland for 1892, which port has also given up about one-half of its business. The total shipments out of the lake ports this year are over two and three-quarters million tons, or nearly 32½ per cent. less shown for 1892, but the ores passing the "Soo" was only 791,586 tons, or 18 per cent. less than last year. So that the greater loss in shipments has apparently fallen to the Menominee range. In the matter of receipts the next table shows that the larger percentage of shrinkage has fallen to the furnaces owned in Chicago; for, deducting from the total, 5,836,749 tons, the amount received at Lake Erie ports, the balance, 503,688 tons, represents ore shipped to Bay View and South Chicago, and to a few other lake furnaces to which water shipments are made. What has been the shrinkage in Joliet, South Chicago and Bay View operations is indicated by the total of 1,824,486 tons last year, and 1,504,756 tons the preceding year.

It is estimated that when the all-rail shipments are reported at the end of the year the aggregate will be rather over 6,000,000 tons, or about 66 per cent. of last year's business. It should be noted that part of the two harbors' shipments, viz., 84,544 tons, should, with the Duluth and Superior shipments, be credited to the new Mesabi range, making an aggregate of 605,119 tons.

IRON ORE RECEIPTS AT LOWER LAKE PORTS HAVE BEEN AS BELOW, IN GROSS TONS.

Ports.	1888.	1889.	1890.	1891.	1892.	1893.
Toledo	75,601	82,961	164,295	191,105	139,987	145,515
Sandusky	154,924	186,082	174,593	105,907	49,736	4,464
Huron	4,351	680	1,200	14,910	65,000	137,700
Lorain	197,000	280,000	280,450	266,009	190,400	165,667
Cleveland	971,775	1,742,415	1,945,492	1,257,775	1,950,224	1,260,716
Fairport	611,140	829,121	1,096,408	699,434	866,611	792,517
Ashtabula	1,288,530	1,963,490	2,176,730	1,599 785	2,555,416	1,845,738
Conneaut	.....	.....	.....	.....	1,139	203,207
Erie	240,338	373,595	487,493	393,759	645,230	469,299
Buffalo	240,000	298,000	548,000	410,000	197,000	*308,238
Total	3,783,659	5,856,344	6,874,664	4,939,684	6,660,734	5,333,061

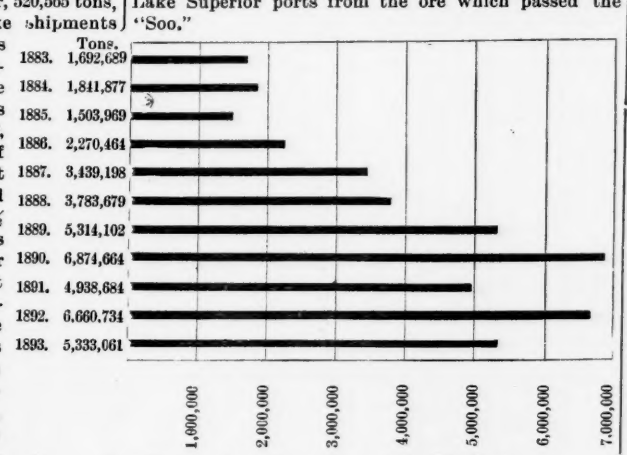
*Includes Tonawanda.

Here, as in the shipments, a nearly new factor appears. And as 1,000 ft. of new dock, equipped with Brown's hoisting and conveying machinery, is under construction at Conneaut, that port, like the Mesabi range, will probably be prominent in future statistics. Taking the relative rank of these ports, Ashtabula not only continues at the head, but increases its lead over Cleveland. From being 128 per cent. of Clevelands in 1891 and 131 per cent. last year, Ashtabula's receipts the past season were 146 per cent. of Cleveland's. Fairport is third Erie fourth and Buffalo fifth, even counting out Tonawanda receipts, though Conneaut's total is close up to Buffalo proper.

The stock on docks on Dec. 1 for 1888 and succeeding years has been as below:

Ports.	1888.	1889.	1890.	1891.	1892.	1893.
Toledo	53,255	85,340	110,740	122,515	71,409	92,911
Sandusky	100,000	175,000	115,000	122,000	87,500	78,439
Huron	9,500	39	1,200	14,910	45,000	89,000
Lorain	100,000	170,000	210,237	250,812	147,600	201,631
Cleveland	527,616	518,816	1,209,467	1,114,762	1,347,992	1,163,950
Fairport	250,000	390,000	721,000	597,617	610,609	578,035
Ashtabula	686,833	1,071,011	1,151,397	903,957	1,312,658	1,296,471
Conneaut	.....	.....	.....	.....	.....	91,337
Erie	95,092	128,900	248,714	252,946	401,683	359,827
Buffalo	26,500	68,000	125,732	129,000	125,000	119,170
Total	1,818,556	3,607,106	3,893,487	3,508,489	4,149,451	4,070,710

A larger proportion than usual of the ore brought down has been shipped direct to the furnaces, so as to take advantage of the rebate given where ore does not go upon the dock. Comparing the amount on docks May 1 of this year with the receipts and the stock on docks, as shown above, it seems that 3,358,148 tons have been shipped the past season against 4,048,471 tons during the season of 1892. What proportion of the ore now on dock has been sold can only be estimated, but the bulk of unsold ore is non-Bessemer. The above figures are understood to be complete and final, except as to all-rail shipments for this year, also the shipments from Marquette were determined by substracting the shipments from all other Lake Superior ports from the ore which passed the "Soo."



Iron Ore Receipts, Gross Tons—Lake Erie Ports.

The diagram showing the iron ore receipts at Lake Erie ports we take from the *Iron Trade Review*, which journal has it from Mr. C. P. Leland, Auditor of the Lake Shore and Michigan Southern. The close correspondence between the records for 1889 and 1893 is noticeable at once, and the close approximation—though somewhat less close—of 1890 and 1892. Mr. Leland, following out his custom of several years, has also computed the percentages for the various ports for 1893 and added to them in the table those of the preceding 10 years.

The Painting of Locomotive Tenders at the Fair.

It has been stated by many that the cars and locomotives exhibited at the World's Fair by American builders were not representative of American practice, and of the reasons given for such statements one is that nearly all such exhibits indicated by their extra finish that they had been prepared especially for display. Of course these statements are in some measure true, but there are some exceptions to be made, or else some of the locomotive builders do not know how to apply the color and varnish to locomotive tanks as it should be done; for some of them sent tanks which had been given an every day finish, trusting that the six months' standing in the protection of the Annex of the Transportation building would not show off the bad workmanship. The six months, however, were three months too many for such a hope to be realized. There were tenders exhibited that showed most excellent workmanship on the part of both the tankmaker and the painter; these showed by contrast the work on the others, the painting of which was disgraceful.

Railroad men remarked about such displays of bad workmanship, and they could have been seen frequently examining such tanks and wondering, no doubt, how much of the side of the tank could be laid bare by an inquisitive finger nail applied under the corner of one of the flakes. It was wondered how much of the pain would have been left on the tanks had they been in use during the six months they stood in the Transportation building, and if much over half would fall off from such when the tenders were being taken from the building.

There is no reason for sending out tanks painted in such a way that a few months service will rattle the paint off. At the last meeting of the Car and Locomotive Painters' Association the question of preparing tanks for painting was discussed, and it seemed to be the unanimous opinion that whether the material be iron or steel, if all rust be removed before painting there will be but little difficulty experienced by the paint flaking off. The question seems to be whether the necessary trouble should be taken to prepare the surface; some of the builders took this trouble and the work was appreciated by those most interested, the railroad men, while other builders went to less trouble and their tanks furnished amusement for many. In this connection it may be stated that those tanks exhibited, in which the inside stiffening angles extended lengthwise of the tank made a better appearance than those in which such stiffening pieces were placed vertically. In the latter the indentations produced in driving the rows of rivets gave the surfaces of the sheets a wavy appearance that was not noticeable in those in which the rows of rivets were lengthwise of the sheet.

The Forging of Eye-Bars and the Flow of Metal in Closed Dies.*

BY H. V. LOSS, M. E., M. AM. SOC. M. E.

(*Continued from page* 904, 1893.)

d.—Forms and Sizes of Eyes.

Up to a few years ago there existed quite a controversy as to the correct form of eye back of the pin. Two distinct types exist to-day, viz., the circular eye and the one having an elongated form. These two shapes are both illustrated by fig. 17, which shows the most accepted standard eye of the circular form, while several modifications exist, when the elongation shape is used. Table No. 24, giving the Keystone standards for iron bars, shows a more rounded back, the underlying principle being always the same, however, when a deviation from the circular form is accepted. If a beam is loaded in the middle and supported at each end its greatest depth needs to be in the center, the width being uniform. If, therefore, the back of the eye could be considered as such a beam—better illustrated if assumed hinged on each side of the pin, as shown on fig. 16—the elongated form would undoubtedly be correct. Such, however, is not the case. It is not a beam loaded in the middle, nor supported at each end.

Fig. 16.

If a bar was fixed at each end and loaded at its center, it would require the same depth—the width still being uniform—at three points, viz., at the center and at both ends, while a load uniformly distributed would require the greatest depth to be equal at both ends. In reality the beam is more fixed than supported, while the load is possibly more central than distributed, as the pin is generally from 1-50 to 1-100 in. less in diameter than the hole in the eye. Taken as a whole, the requirements—if not favoring a heaviest dimension at the sides—certainly do not demand the greatest depth at the center. A uniform dimension around the back of the pin will, therefore, come nearer the desired results than any irregular shape. Professor Burr has written a lengthy and a very thorough paper on this very question; it was published in the proceedings of the American Society of Civil Engineers for 1875. He assumes here, however, that the pin, when under stress, exerts a normal pressure against the eye on its circumference. Such an assumption is too delicate, and as it is a well known fact in all analysis

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RECEIPTS OF IRON ORE AT LAKE ERIE PORTS, 1883-1893, ELEVEN YEARS—GROSS TONS.

Year.	Per cent.	Ashtabula.	Per cent.	Cleveland.	Per cent.	Fairport.	Per cent.	Erie.	Per cent.	Buffalo.	Per cent.	Lorain.	Per cent.	Sandusky.	Per cent.	Toledo.	Per cent.	Huron.	Per cent.	Conneaut.	Total.
1883	39.6	670,000	42.7	723,129	2.4	40,334	6.3	106,737	2.4	40,203	1.5	25,794	3.5	58,825	1.6	27,617	....	.....	.....	.....	1,692,689
1884	35.3	650,000	49.1	904,850	1.3	23,100	6.3	116,027	0.5	8,760	1.6	30,456	5.8	106,540	0.1	2,444	.....	.....	.....	.....	1,841,877
1885	38.7	582,000	39.2	589,234	2.1	31,992	8.1	122,323	0.5	7,180	0.9	13,180	9.5	143,180	1.0	15,000	.....	.....	.....	.....	1,503,969
1886	29.6	672,000	45.6	1,034,650	4.9	112,000	4.0	91,250	1.4	31,869	4.4	99,714	7.0	157,970	1.2	26,960	1.9	44,021	.....	.....	2,270,464
1887	32.1	1,103,839	35.4	1,216,423	14.6	501,568	6.1	210,488	0.8	28,699	3.9	134,764	4.7	160,600	1.8	61,729	0.6	21,288	.....	.....	3,439,198
1888	34.1	1,288,530	25.7	971.795	16.2	611,140	6.3	240.338	6.3	240,000	5.2	197,000	4.1	154,924	2.0	75,601	0.1	4,351	.....	.....	3,783,679
1889	36.8	1,955,530	26.2	1,390,283	15.6	829,121	5.5	291,455	5.6	298.000	5.3	280,000	3.5	186,082	1.5	82,951	...	680	.....	.....	5,314,102
1890	31.7	2.176.730	28.3	1,945,492	15.9	1,095,408	7.1	487.493	8.0	548,000	4.1	280,450	2.5	174,596	2.4	164,295	...	1,200	.....	.....	6,874,664
1891	32.4	1,599.785	25.5	1,257,775	14.2	699.434	7.9	593,759	8.3	410,000	5.4	266,009	2.1	105,907	3.9	191.105	0.3	14.910	.....	.....	4,938,684
1892	38.4	2,555,416	29.3	1,950,224	13.0	866.611	9.7	645,230	2.9	197,000	2.9	190,400	0.7	49,736	2.1	139,987	1.0	65,000	...	1,130	6,660,734
1893	34.6	1,845,738	23.6	1,260,716	14.9	792,517	8.8	469,299	5.8	308,238	3.1	165,667	0.1	4,464	2.7	145,515	2.6	137,700	3.8	203,207	5,333,061

of this kind that a rather small deviation from the assumed elastic conditions of a bar will greatly change the results, I should, for practical purposes, attach a great deal more weight to the experimental data, which happily is at hand in sufficient quantity to establish the desired facts. While several more or less isolated experiments have been conducted from time to time, as, for instance, by Messrs. Charles Macdonald and Charles D. Fox, of London, England, and others, the most complete results in this direction have been acquired by the late Mr. C. Shaler Smith, of St. Louis, who published in the proceedings of the American Society of Civil Engineers for 1877 the conclusions derived by 114 experiments, 57 of which were made of iron-hammered bars—the eyes having been made separately and afterward welded to the body of the bars—manufactured for the St. Charles bridge, the experiments being made

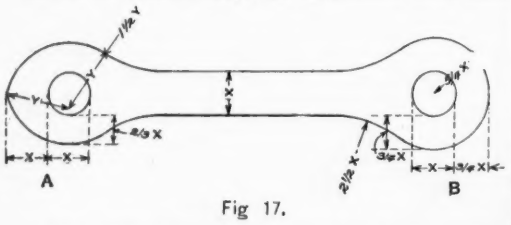


Fig 17.

at St. Charles. The type of eye was the one shown by A, fig. 17. The remaining 54 bars were made of steel by the Edge Moor Iron Co., the tests also being conducted at that place. The type of eye used was the one shown by B, fig. 17. The latter bars were made for the Kentucky River bridge. The bars in both tests were of rather small dimensions, from 3 to 4 in. in width, the other relative dimensions being given by fig. 17. The tests were made by hydraulic power, the bars being pulled to destruction.

Mr. Smith's conclusions were so distinct and well defined, that I can do no better than simply quote his own words, which were:

"1. As the relative proportion of diameter of pin to width of bar increases, more metal is required in the section across the eye.

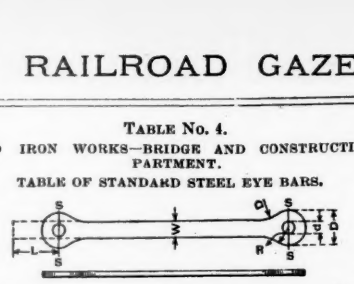
"2. In hydraulic forged eyes, this—across the eye—is the weak point and governs the rest of the eye, which is consequently a true circle.

"3. In hammered eyes two points must be fixed, the section back of the pin and the section across the eye.

TABLE No. 4.

PENCOYD IRON WORKS—BRIDGE AND CONSTRUCTION DEPARTMENT.

TABLE OF STANDARD STEEL EYE BARS.



W Width of bar.	t Minimum thickness of bar.	D Diam. of head.	d Diam. of largest pin hole.	L Additional length of bar beyond center of eye required to form one head.
In.	In.	In.	In.	In.
3	¾	7	3	15
3	¾	8	3⅞	17½
4	¾	9½	4⅛	18
4	¾	10½	5 1/16	20½
5	¾	11½	4 13/16	19½
5	¾	12½	5 11/16	23¼
5	¾	13	6 3/16	26½
6	⅞	13½	5⅛	23
6	⅞	14½	6 5/16	26¼
7	1 1/16	16	6 1/16	26¾
7	1 1/16	17	7½	30¼
7	1 1/16	18	8½	36¾
8	1	17	6⅝	26¾
8	1	18	7⅜	30
8	1	18½	7⅞	33¾

NOTE.—To all bars up to 6 in. wide and 1 in. thick and under add 1½ in extra for each eye to the length of the bar

To all bars up to 7 and 8 in. wide and 1⅛ in. thick and under add 1½ in. extra for each eye to the length of the bar.

NOTE.—Pencoyd standard eye bars are hydraulic forged and are guaranteed to develop the value of the bar, under conditions given in the above table, when tested to destruction. The maximum sizes of pin holes as given in the above table allow an excess in sectional area of head on line S S over that of the body of the bar of 33 per cent. for diameters of pins not larger than the width of the bar, and 36 per cent. for pins of larger diameter than width of bar; the thickness of eye being the same as the thickness of the body of the bar.

NOTE.—The steel manufactured by us for the use of eye bars is open hearth steel and will be furnished of such quality as to satisfy the demands of engineers.

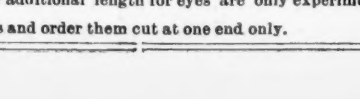
TABLE No. 6.

U. B. CO., ATHENS, PA. STANDARD PROPORTIONS FOR STEEL EYE BARS.

Width of bar.	Diam. of head.	Diam. of largest pin.	Per cent. of excess in heads over that of body of bar on line A-A. Head same thickness as bar.	Head 1/16 in. thicker than bar; bar 1 in. thick.	Head 1/16 in. thicker than bar; bar 2 in. thick.	Stock required beyond center of pin to form one head.
In.	In.	In.	In.	In.	In.	In.
3	6	2	33⅛	41	37½	.....
	6½	2⅛	33⅛	41	37½	.....
	7	3	33⅛	41	37½	.....
	7½	3⅛	33⅛	41	37½	.....
	8	3⅜	37½	46	41	.....
	8½	4⅜	37½	46	41	19½
	9	4⅜	37½	46	41	.....
	9½	5⅜	37½	46	41	.....
	10	5⅜	37½	46	41	.....
4	8	2¾	31	39	35	.....
	8½	3¼	31	39	35	.....
	9	3¾	31	39	35	15
	9½	4¼	31	39	35	.....
	10	4⅜	34	42	38	20
	10½	5⅛	34	42	38	.....
	11	5½	37½	46	42	24½
	11½	6	37½	46	42	.....
	12	6⅛	37½	46	42	31
5	10	3½	30	38	34	.....
	10½	4	30	38	34	.....
	11	4½	30	38	34	17½
	11½	5	30	38	34	20
	12	5⅛	30	38	34	22
	12½	5⅞	32½	40	36	.....
	13	6⅜	32½	40	36	26½
	13½	6¾	35	43	39	.....
	14	7¼	35	43	39	30
6	12	4⅛	31	39	35	.....
	12½	4⅝	31	39	35	.....
	13	5⅛	31	39	35	19½
	13½	5⅝	31	39	35	21
	14	6	33⅛	41	37½	23
	14½	6½	33⅛	41	37½	25½
	15	7	33⅛	41	37½	.....
7	14	4⅞	30	38	34	.....
	14½	5⅜	30	38	34	18½
	15	5⅞	30	38	34	22½
	15½	6⅜	30	38	34	.....
	16	6¾	30	38	34	.....
	16½	7⅜	30	38	34	28½
	17	7⅞	30	38	34	30½
8	16	5⅝	29	37½	33½	.....
	16½	6⅛	29	37½	33½	.....
	17	6⅝	29	37½	33½	.....
	17½	7⅛	29	37½	33½	.....
	18	7⅝	29	37½	33½	27½
	18½	8⅛	29	37½	33½	28½
	19	8⅝	29	37½	33½	29½

TABLE 3.—EDGE MOOR BRIDGE WORKS, EDGE MOOR, DEL., P. O. WILMINGTON, DEL.

Steel Eye Bars.



Dimensions in inches.

A Width of body of bar.	B Minim'm thickness of bar.	E Diamet'r of head of bar.	D Diamet'r of largest pin hole.	Sectional area of the head on the line S S in excess of that in the body of bar.	G Additional l'ngth of bar beyond center of eye required to form one head.	A Width of body of bar.	B Minim'm thickness of bar.	E Diamet'r of head of bar.	D Diamet'r of largest pin hole.	Sectional area of the head on the line S S in excess of that in the body of bar.	G Addition'l l'ngth of bar beyond center of eye required to form one head.
2	1	4½	1⅞	33 per cent.	9¼	5	¾	11½	4⅝	37 per cent.	21¼
2	1	5½	2⅜	33 "	13½	5	⅞	12½	5⅛	37 "	25¼
2½	1	5½	2⅜	33 "	10½	6	⅞	13½	5¼	37 "	23
2½	1	6½	3⅛	33 "	14½	6	1 1/16	14½	6¼	37 "	27¼
3	¾	6½	2½	33 "	11¾	7	1 1/16	15½	5⅝	40 "	25¾
3	¾	8	4	33 "	17½	7	1 1/16	17	7⅛	40 "	31¼
4	¾	9½	4⅛	33 "	18	8	1	17	5¾	40 "	26¾
4	¾	10½	5⅛	33 "	22¼	8	1	18	6¾	40 "	30

NOTES.

Edge Moor standard eye bars are hydraulic forged without the addition of extraneous metal and without buckles or welds, and are guaranteed under the conditions given in the above table to develop value of the bar when tested to destruction.

The heads on standard eye bars are finished of the same thickness "B" as body of bar.

We contract only for finished eye bars, that is, with the eyes bored at distances apart from center to center, as required, and of right diameter to fit the size of pin to be used.

Unless otherwise specified, steel of the following quality will be used:

Ultimate strength, 60,000 to 68,000 lbs. per square inch.

Elastic limit not less than one-half the tensile strength.

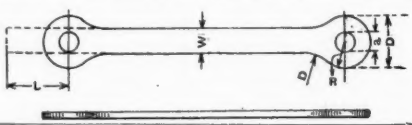
Elongation, from 17 to 20 per cent., the elongation to be measured.

After breaking on an original length of 16 times the shortest dimensions of the test piece, reduction of area 34 to 40 per cent.

To all bars one inch thick and under, add 1½ in. to the above adds.

TABLE No. 5.

THE PHŒNIX BRIDGE CO.—TABLE OF STEEL EYE BARS.



W Width of bar.	a Size of pinhole.	D Diameter of head.	2 L Additional length of bar beyond center of eyes to form two eyes. For bars ⅞ in. thick and over.	2 L Additional length of bar beyond center of eyes to form two eyes. For bars less than ⅞ in. thick.
In.	In.	In.	In.	In.
3	2 7/16 and 2½	7	24	26
3	3 1/16 and 3⅛	8	33	36
4	3 7/16	9	30	33
4	3⅝, 4 1/16, 4¼	10	38	41
5	3⅝ and 4 1/16	11	36	39
5	4¼ and 5 1/16	12	43	47
5	5⅜ and 6 1/16	13	52	56
6	4¼ and 4⅝	13	41	45
6	5 1/16, 5⅜, 5⅝	14	49	53
6	6 1/16, 6⅜, 6⅝	15	57	.....
7	5 5/16	15	48	.....
7	5⅝, 6 1/16, 6¼	16	54	.....
7	6⅜, 7 5/16, 7½	17	62	.....
8	6 5/16, 6½, 6¾	17	53	.....
8	7 5/16, 7½, 7¾	18	60	.....
9	7¼ and 8 5/16	19	68	.....
9	8 5/16 and 9⅜	20	76	.....
9	7⅜ and 7¼	20	66	.....
9	8⅜ and 8 5/16	21	73	.....
10	8⅜	22	71	.....
10	8 5/16 and 9⅜	23	78	.....
10	10 and 10½	24	86	.....

NOTE.—Thickness of eye same as thickness of body of bar, or not to exceed the same by more than 1/16 in.

Caution.—The above allowances for additional length for eyes are only experimental and subject to revision in accordance with further experience.

In ordering bars call attention to this and order them cut at one end only.

"4. A pin of a diameter equal to 66 per cent. of the width of bar is the smallest which will invariably break the bar or develop its full strength." It seems thus fair to assume that the elongated eye is proper for iron bars, especially if hammered. This fact is possibly due to the weakness of this material across its fibers. It is remembered that considering the back of the eye as a beam, the tension and compression on the center line are here across the fibers, hence the greater depth.

The amount of material on each side of pin has continuously been decreased, as the modes of manufacture have been improved. Starting originally for steel bars with the same excess in eye as is at present used for iron, viz., 50 per cent., this figure has gradually been lowered down to 30 per cent., and in many instances 25 per cent., or even less, has broken the body of the bar. Different makers have slightly different standards, and referring to Table No. 2†, as representing "piled" and hammered iron eyes, the following tables, 3, 4, 5 and 6 give the standard dimensions for steel eye-bars, as made by the leading manufacturers of United States. These tables give also the largest diameter of pins that can properly be used in connection with given dimensions of eyes and widths of bar. As showing a successful application of a very small excess for eye, see the experiments made with Edge Moor bars, as published by Mr. Joseph M. Wilson in the proceedings of the American Society of Civil Engineers in 1886. On 4 and 5-in. bars of about 1 in. thickness—steel—an excess varying from 21 to 26 per cent. successfully broke the bars, when pulled to destruction. As to the stresses in eye-bar heads, Mr. Theodore Cooper published in the proceedings of the same society for 1878 a paper giving some interesting results derived from watching the scale falling off the eye-bars, when under stress in a testing machine.

(TO BE CONTINUED.)

Cory's Force-Feed Lubricator.

We show by two engravings a system of locomotive lubrication which has been especially designed to meet the trying demands of fast trains, running comparatively long distances between stops. The device appears to be convenient and efficient and to have stood the test of actual practice.

The lubricator, fig. 1, is conveniently placed in the cab, and has an oil-supply reservoir of one gallon capacity. At the lower part of this reservoir is seated a hollow conical valve *A*, the cavity in which will hold about 1/10 of a gallon. This is the oil discharge reservoir and is connected to the oil supply reservoir by a small valve, *B*, seated in the upper part of the hollow valve. The side of the hollow valve is perforated by a hole, *E*, ⅛ in. diameter, that can be brought to coincide with any one of the 16 outlet holes at the base of the oil-supply

† See page 847, 1893.

reservoir, each of which connects with a line of pipe to a given bearing.

There are 16 notches on the upper rim of the lubricator, and when the lever is brought to any one of these notches the hole in the side of the conical valve registers with a given hole in the base to an outlet pipe.

When the lever is thus placed for any one bearing desired, a valve shown, attached to the base, and connected to either steam or air pressure, is opened, and

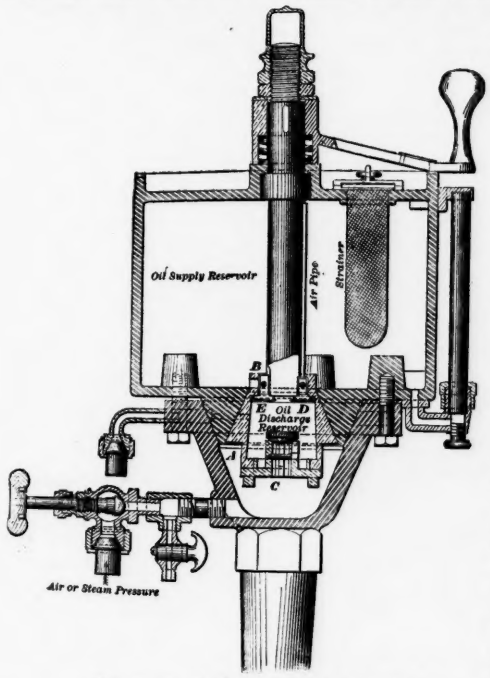


Fig. 1—Cory's Force Feed Lubricator.

pressure enters through the small valve *C*, closing valves *B* and *D*, and forcing the contents of the oil-discharge reservoir through the hole *E*, and through the line of pipe to the bearing to be oiled. This requires but a moment, when the pressure should be shut off, and the lever placed midway between any two notches, and in about five seconds the discharge reservoir will again be filled and ready for discharging again to any desired bearing.

For all main journals, three-way tips are furnished for the ends of pipes, and the wedges and jaws are oiled as well as the journal. Thus, the engineer has, at his command, a positive means of oiling all parts of his engine, however fast the engine may be running, and however long the distances he is obliged to run without stops, thus preventing much heating and cutting of bearings, many delays to trains and possible accidents.

The use of this device is not intendedto relieve the engineer from the responsibility of adjusting his present oil cups and inspecting and oiling by hand when first taking the engine out from the terminal station, the same as if it was not equipped with the force-feed lubricator. There is simply placed at his hand a gallon of oil that can be forced from the cab to any desired bearing as occasion requires. There are now a number of locomotives running equipped with these lubricators, some having been in service for two years, and we are told that they have never failed to perfectly perform their work, and that none have required repairs of any kind to lubricator or any piping. The piping can be either ⅛ in. wrought iron or copper pipe. A view of the general arrangement is given in fig. 2. This device is being placed upon the market by M. C. Hammett, Troy, N. Y.

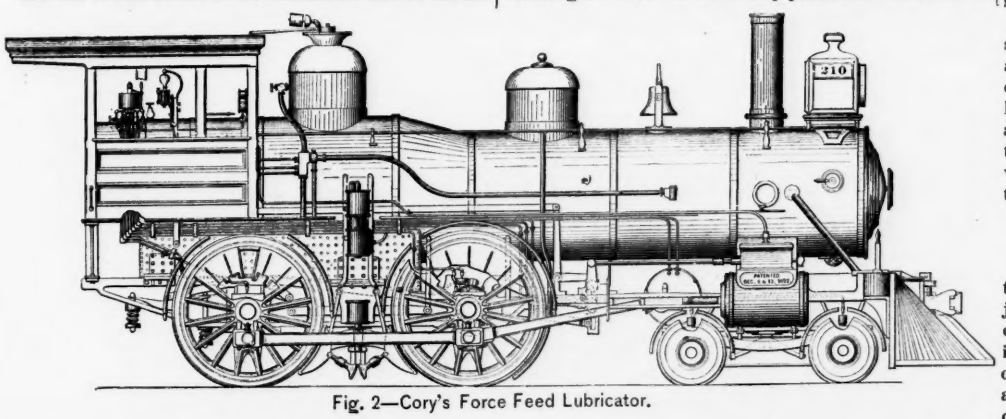


Fig. 2—Cory's Force Feed Lubricator.

The General Managers' Association of Chicago.

BY A CHICAGO RAILROAD MAN.

The value of the General Managers' Association of Chicago to its members, and directly and indirectly to all the Western roads, warrants a more general knowledge of its aims and accomplishments than has heretofore been available. That the results of its work have not become more widely known is due to the conservative methods pursued by its members, who have been desirous of thoroughly testing its efficiency before claiming success.

The Association had its inception in April, 1886, and until the latter part of the year 1889 meetings were frequently held, during which time Mr. E. T. Jeffery was its chairman. Considerable progress was made during that time toward rendering the Association permanent, but various obstacles were encountered, and in 1889 regular meetings were suspended. However, during that time the Association was instrumental in establishing the Chicago Car Service Association, the second organization of the kind in the United States. The subsequent successful operation of this Association has repaid many times over the expenditure of time and money involved in the attempt to put the Managers' Association on a firm footing. Early in January, 1892, a determined effort was made to reorganize the Association. In this work, Mr. E. St. John, General Manager of the Chicago, Rock Island & Pacific, was indefatigable, and it is largely owing to his efforts that the Association was at that time reorganized. As a fitting recognition of his labor and ability he was made its Chairman, which position he has since held by successive re-elections.

The Association as at present constituted consists of 23 members, embracing all the Chicago roads with two exceptions. The objects of the Association are broadly stated as being the consideration and determination of problems of management arising from the operation of railroads. For the better systematization of the work provision is made for four general committees. Among the duties assigned to these committees are the following:

The formulation and submission of rules for the uniform and equitable government of all classes of employees, including the tabulation of wage schedules and wage conditions in force on the lines of the members of the Association and other roads in the territory.

The scheduling of rates of pay upon the roads members of the Association. To this committee are referred all applications for increased pay or changes in schedules and rules, and upon their judgment the Associa tion in a large measure acts. It is said that in no case thus far has the decision of this committee been overruled by the Association. The value of a committee of this kind is apparent not only to the roads but to the employe as well. It tends to render uniform the wage schedules in the territory, thus disposing of one of the most fertile causes of complaint among the employes by placing all on an equal footing for similar service. This committee endeavors to recognize all legitimate requests and to grant them in so far as seems to be warranted by the conditions obtaining, when it can be done without detriment to the general or individual interests of either party. Its success is no doubt largely due to the fact that its manifest impartiality and desire to deal justly by all inspires the confidence in both parties which is too often lacking when an individual line endeavors to settle questions of this kind.

To these committees are added two others fully empowered to make all necessary arrangements for the securing of labor to meet any particular case and to take charge of the interests of the members in times of trouble. The last of these committees is called upon only in extremities when all efforts on the part of the individual members and the Association have failed to adjust differences and a labor disturbance seems imminent or is actually precipitated. This committee is composed of men of the highest executive ability and is given unlimited authority, backed by the entire financial, moral and physical resources of the Association. It speaks well for the success of the general organization that this committee has been called upon only three times during the past year and a half. In each case ill-advised strikes seemed imminent, but the restraining and conservative influence of the Association prevented serious results. The history of the Association thus far goes to prove that the availability of the machinery of such an organization exerts a potent influence in the direction of arbitration.

Among the material reforms which have been brought about through the instrumentality of the Association, may be noted the now quite general weighing of live stock and the collecting of charges on it, based on weight (per 100 lbs.) and the regulation of opening and closing hours of freight houses.

The committees of the Association are at all times ready and anxious to meet with business men and discuss with them all questions of difference, correct manifest evils and patiently and candidly explain the policy of the members in regard to matters of rates and rules, which, through lack of adequate knowledge, the public is frequently inclined to consider unreasonable.

Other subjects which have at times been under consideration during the present year and which are still pending, and from the consideration of which it is hoped substantial results will subsequently follow, are the establishment of a per diem interchange charge on freight cars, the advisability of the establishment of an employment bureau; the advisability of increasing the length of steel rails, and the problems arising under the operation of the present switching rules.

It would seem that the substantial results thus far apparent from the operation of this Association would justify the attempt to organize similar Associations at other central points. Such an attempt was made, but as yet has been without result owing to lack of knowledge as to its importance and a failure to secure adequate representation of the various interests at meetings called to discuss the subject.

Chicago Main Drainage.

Mr. N. W. Weston, Superintendent of Construction for the Sanitary District, reports that the 20 miles of main canal now under contract between Summit and Lockport can be completed by April, 1897, although seven sections are being badly handled. One section, No. 6, at the present rate of progress, will take 16 years to complete, and one section, No. 14, which is in the hands of a receiver, is to be relet by the Court.

The diversion of the Des Plaines River, which requires the excavation of about 1,600,000 cubic yards of glacial drift and 2,400,000 cubic yards of rock, is virtually completed. The new channel, which is about 20 miles long, extends from near Riverside to the Romeo road. It is 200 ft. wide on the bottom and the main drainage canal is protected against any overflow from it by a continuous level averaging about 11 ft. high.

The Drainage Trustees have lately awarded contracts for five miles of excavation, extending from Summit to Central Park avenue, parallel to and about 1,100 ft. north of the old Illinois and Michigan Canal. The prices varied from 19.7 cents to 28 cents per cubic yard. The total excavation is 6,534,000 cu. yds., and the aggregate cost foots up to $1,635,817. In their report on the letting, the Finance Committee, after claiming to have made a careful investigation of the bidders in regard to cash capital, their proposed methods of work, experience, and all other matters required to form a proper judgment in making awards for the best interest of the district, say that the experience of the board in regard to several of the contract sections lying between Summit and Lockport has clearly demonstrated that it is not always wise to let to the lowest bidder, even when said lowest bidder may be able to give the required bond. The board must exercise a wise discretion and select such bidders as in its opinion will prosecute the work diligently to completion within the limit of time set forth in the contract.

As a matter of fact, the Committee refused to let a section to either of two bidders, one at 28 and the other at 28.4 cents, as the two firms bidding were not able to convince the Committee that they were capable of handling such large contracts, and the award was made to another firm that has the next section to it at 29 cents, they taking the section in dispute at the lowest bid, viz., 28 cents. The total length of canal now under contract is 25 miles.

Peruvian Railroad Returns.

The report of the directors of the Peruvian Corporation, Limited, for the year ending June 30, 1893, has just been issued, and shows a net profit, after payment of debenture interest and all charges, of $134,530. This includes the results of all the various operations of the corporation. The net receipts from the railroads amounted to $487,094. The Central Railroad has been opened to Oroya within the year, but the traffic has been less than was anticipated, owing to the failure of mineowners to increase their production—a result of the decline in silver. There is evidence, however, of increased agricultural activity in the temperate plateaus in consequence of the new facilities for transportation, so that important shipments of grain and cattle are expected within the coming year.

The net income from the Central Railroad was $117,801, including the contractor's guaranteed rent charge to Sept. 30, 1892. The Southern Railway from Mollendo to Puno yielded a net return of $253,614, including the traffic on the branch to Sicuani, which has been in operation throughout the year. The steamers on Lake Titicaca netted $17,948, and the navigation on the Rio Desaguadero, which had been open for nine months, returned, net, $2,634.

Contracts are made for handling the output of the Corocoro and other copper mines near the Rio Desaguadero, in Bolivia, which will materially increase the traffic on these water routes as well as on the Southern Railway during the current fiscal year. The Trujillo Railroad has been extended to Cartavio, a distance of five miles. The net income of this line was $66,363. The other railroads are in the hands of lessees and only yield a rental to the corporation.

An agreement has been reached with Mr. Blume re

garding the Payta-Piura Railroad, whereby the road passes into the hands of a new company incorporated as the Payta to Piura Railway (Peru), Limited, with a capitalization of £100,000, of which the Peruvian corporation receives £45,000. The Peruvian corporation allocates £80,000 of its own debentures for the discharge of existing liabilities of the railroad and for other purposes of the new company, these debentures to constitute a first lien upon the road. Repairs to the road are to be undertaken at once and a new mole is to be constructed at Payta.

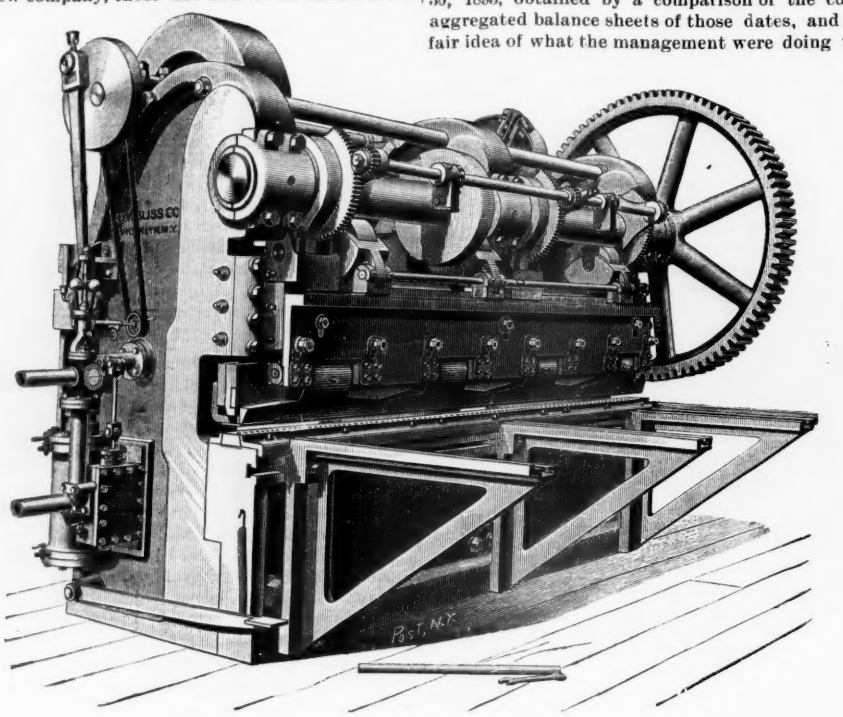


Fig. 1—Gang Punching Press.

Gang Punching Press.

The accompanying illustration is of a punching machine designed to punch a large number of holes at one stroke. Fig. 1 shows it arranged for punching 150 holes ¼ in. diameter through ¼ in. thick iron. The vertical engine at the left furnishes the power to the crank shaft at the top of the machine, and on this shaft is a friction clutch, which may be thrown in and out by a foot treadle, giving the operator complete control of the machine. When the crankshaft has made one revolution, a cam automatically throws out the friction clutch, applies a brake and stops the machine at the highest point. This device is said to obviate entirely the difficulties experienced with positive automatic clutches on heavy-geared presses.

The adjustment of the slide is effected by means of an eccentric interposed between the crank-pin and the pitman, which eccentric disc is actuated by means of the pinion shaft shown in front of the main shaft in the cut, this shaft being turned by hand by means of a ratchet, which is permanently attached to it, as shown.

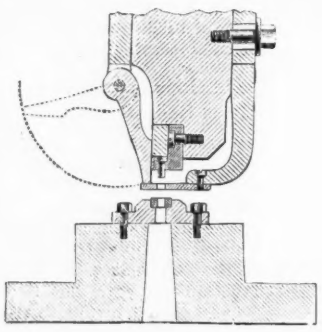


Fig. 2.

Another special feature of this machine is the cam-actuated stripper. This stripper is actuated by two cams on the crankshaft which cause it to descend before the punches, straightening the sheet and holding it during the punching action. Fig. 2 plainly shows the construction of this stripper. The main advantage of this stripper is that it permits the use of shorter and consequently stiffer punches. By making the front portion in sections, as shown, it is possible to renew easily punches which have been bent or broken. As will be seen (fig. 2) these portions of the stripper are hinged and can be swung forward easily.

The principal dimensions of the press are: Length of table, 154 in.; width of table, 12 in.; length of slide, 154 in.; stroke, 2 in.; diameter of shaft, 8 in.; diameter of eccentric, 10 in.; back gearing, 1 in. to 28 in.; total weight about 60,000 lbs. It is built by the E. W. Bliss Co., Brooklyn, N. Y.

Atchison, Topeka & Santa Fe.

The annual reports of this company contain so many financial and statistical statements that to cover them by a succinct and comprehensive analysis seems almost impossible.

The following is a summary of the results of action on the respective accounts between June 30, 1890, and June 30, 1893, obtained by a comparison of the condensed aggregated balance sheets of those dates, and gives a fair idea of what the management were doing with the means at its command during the period that succeeded reorganization, viz.:

Results of Financial Transactions, combined lines, from July 1, 1890, to June 30, 1893:

NET MEANS REALIZED.		
From decrease in Assets.		
Securities deliverable under reorganization, Circ. 63	$6,516,469.49	
Miscellaneous investments in stock, bonds and real estate	874,144.59	
Miscellaneous accounts	166,378.46	
Notes receivable, part due	28,449.63	
U. S. Trust Co., N. Y., Trustee	562,985.15	
Sundry open accts. due St. L. & S. F. R. R.	1,469,927.12	
Bills receivable	2,112,649.73	
Cash	1,709,827.25	
Sundry bonds, subject to exchange	1,667,410.84	
Total decrease in assets		$15,108,246.26
From Increase in Liabilities.		
Funded debt	$33,887,595.00	
" " collateral for other issues	6,478,000.00	
Am'ts due auxiliary cor	85,583,694.33	
Adjustment acc't (St. L. & S. F. preferred stock)	5,000,000.00	
Accounts payable, dividends, etc.	$3,233,821.28	
Bills " "	5,880,692.15	
Bond interest matured	532,315.51	
Total increase in liabilities		$60,596,118.27
From Increase in Stock.		
St. L. & S. F.	$20,000,000.00	
Colo. Midland	8,000,000.00	
		$28,000,000.00
Income and Surplus.		
Cancelled Bonds	$1,772,000.00	
Profit and loss account operation	693,826.88	
" " " " off-setting deficit, June 30, 1890	1,702,381.38	$4,168,208.26
Total net means realized		$107,872,572.79
Which was disposed of as follows:		
Increase in Assets.		
Cost of road and equipment	$47,881,702.11	
Bonds and stock of auxilliary companies used as collateral	23,751,293.44	
Bonds of leased and auxiliary lines subject to redemption	2,565,765.00	
Capital stock in Treasury	9,015,387.50	
Accts. in process of adjustment	1,321,275.89	
Due from auxiliary companies	8,634,648.58	
Material and fuel	769,723.36	
Accts. receivable	2,070,406.31	
Bonds in Treasury	4,323,583.30	
Total increase in assets		$100,333,785.49
Decrease in Liabilities.		
Auditor's suspended accounts	$528.82	
Accounts in process of adjustment under reorganization	480,580 00	
Union Trust Co.'s certificates representing new securities	2,920,682.83	
Subscription account, Circ. 63	682,880.00	
Securities delivered under Circ. 63	2,245,370.46	
Accrued obligations not yet due, June 30, 1893	1,203,792.94	
Miscellaneous	4,952.25	
Total decrease in liabilities		$7,538,787.30
Total disposed of		$107,872,572.79

From the foregoing it appears that the amount realized from a decrease in the assets was $15,108,246.26, from an increase in liabilities $60,596,118.27, of which $40,365,595. was from an increase in the funded debt, from increase in stock $28,000,000, of which $20,000,000 was an increased issue of St. Louis & San Francisco, and $8,000,000 the stock of the Colorado Midland, acquired in September, 1890, and from income account $4,168,208.26.

In disposing of these amounts, these liabilities were decreased $7,538,787.30, and the assets increased $100,333,785.49, of which $47,881,702.11 was for cost of road and equipment. If we deduct from this last the cost of road and equipment, Colorado Midland, on June 30, 1890 ($18,383,851.60), we find that the increase in that item for the three years ended June 30, 1893, was $29,497,850.51. When such improvements or additions are made to the cost of road and equipment and there is only an available surplus of $693,826.88 to apply to it, it is very clear that money must be obtained by an increase in the funded debt, in other liabilities, in stock, or in two or possibly in all three of these items.

It has been the misfortune of many roads not to have made provision for improvements and new equipment by increasing the funded debt proportionately (in accordance with the practice on English roads) when the net income does not cover such improvements, etc., and as a sequence the floating debt and current liabilities increase from time to time until they get beyond control. Surplus of income continually appears in the annual reports, but the amounts expended for account of construction and equipment are not stated in juxtaposition, and sometimes not at all, so that when a Receiver is appointed the stock and bondholders are surprised.

In the case of this line the management seemed to anticipate that provision should be made for such additions and wisely arranged to issue class "B" bonds to the extent of $20,000,000 in all, limiting the amount issued per annum to $5,000,000. Up to June 30, 1893, $5,000,000 of these bonds had been issued.

The increases in the funded debt, accounts payable and bills payable, considering the character of assets acquired other than the cost of road and equipment is scarcely satisfactory.

The average mileage operated June 30, 1890, was 8,962.17, and on June 30, 1893, 9,344.57, the chief increase being on account of the Colorado Midland R. R., 350.42 miles.

The current accounts as stated on the aggregated balance sheet show the following:

Accounts payable, $7,468,044.75, against which are accounts receivable amounting to $7,272,665.47. These accounts are about an average for so large a road, and can take care of themselves.

The bills payable amount to	$7,257,901 15
" receivable "	851,725.95
Leaving to be paid, provided the bills receivable are good	$6,406,175.20
Bond interest matured	4,072,021.74
Total	$10,478,196.94
Against which there was (immediately available) cash	5,165,524.85
Leaving	$5,312,672.09
To which add accrued obligations not yet due (June 30, 1893), but payable soon thereafter	2,110,500.44
Total to be provided for in July, 1893, or immediately after	$7,423,172.53
To offset which the company had marketable (?) securities in treasury as follows:	
St. L. & S. F. 4 per cent. consols, the property of St. L. & S. F. Co.	$2,562,700.60
Col. Midland 4 per cent. consols, the property of Col. Midland	1,447,000.00
Atchison general mortgage and scrip 4 per cent., the property of A., T. & S. F. Co.	2,276,020 80
Atchison second mortgage and scrip, class A, 4 per cent., the property of A., T. & S. F. Co.	451,256.90
A., T. & S. F. guarantee fund notes, the property of A., T. & S. F. Co.	2,000,000.00
St. L. & S. F. 4 per cent consols (par $3,808,100) the property of A., T. & S. F. Co.	2,715,709.00
Total	$11,752,686.70

The $2,000,000 guarantee fund notes stand against $9,000,000 of such notes to be paid out of proceeds of bonds or exchanged therefor, and are included in the funded debt of the A., T. & S. F. Co., $228,082,200, that amount ($2,000,000) only having been paid and we should not think could be marketed. The other securities named could hardly have been sold in July, 1893, or since, except at a sacrifice that would not have been justifiable.

The bonded debt of the combined lines in the system, including bonds in the treasury, is		$331,185,629.00
Other liabilities amount to		49,835,569.45
Total liabilities		$381,021,198.45
Capital stock combined lines		241,360,300.00
Income and surplus to balance assets		2,465,826 88
Total		$624,847,325.33
Cost of road and equipment, combined lines		310,478,694.82
Bonds, stocks, etc., auxiliary lines		245,670,333.86
Capital stock in treasury:		
A., T. & S. F. Co.	$176,512.50	
St. L. & S. F. Co.	23,640,700.00	
		23,817,212.50
Deferred assets, combined lines		17,135,925.05
Current assets, combined lines		27,745,159.10
Total assets		$624,847,325.33
The bonded debt per mile of line (9,344.57 miles) is.		$35,441.50
Other liabilities per mile of line (9,344.57 miles) is.		5,353.10
Capital stock per mile of line (9,344.57 miles) is.		25,528.93
Total		$66,603.53

When we consider that much of this line runs through a level country where the cost of construction is from $7,000 to $10,000 per mile, it would seem that from $20,000 to $25,000 per mile would have been sufficient to cover cost of road, structure and equipment. Further comment is unnecessary.

The net income from all sources during the year ended June 30, 1893, was		$16,168,482.18
The direct fixed charges were:		
Taxes	$1,544,811.61	
Rentals	1,296,336.73	
Interest on bonds	11,573,646.86	
		$14,414,845.20
Surplus		$1,753,636.98
Construction and equipment during the year		4,151,700.76
Leaving to be provided for from sources other than income from operation		2,398,063.78

Measure of traffic:

Tons—one mile per mile of line	318,331
Passengers one mile per mile of line	49,741
Average rate per ton per mile	1.192c.
Average rate per passenger per mile	2.273c.

The density of traffic is about equal to lines similarly situated, but not as great as it should be. The freight rate is fair, all things considered, but should be a fraction higher to apply to such light freight traffic. No money can be made from such an amount of passenger traffic at the average rate named. It will be found that, if a fair proportion of the passenger earnings be applied to the fixed charges (say same percentage as passenger expenses bear to the whole expenses) a loss will be shown. I took this matter up some years ago and satisfied myself that passengers were getting low rates at the expense of freight shippers; in other words, that the freight earnings had to stand a much larger portion of the fixed charges than they should. My investigation at the time was confined to the lines west of Chicago, and the A., T. & S. F. was included. I do not believe that any of the great systems extending west of the Missouri River can make anything out of passengers at less than an average rate of 2¾ to 3 cents per mile.

The passenger traffic on the Pennsylvania Railroad is about six times as great as on the Atchison, Topeka & Santa Fe system, on the New York Central about eight times, and on the Erie about five times; yet averaging nearly 2 cents per mile per passenger, while the Western lines mentioned only average $2\frac{3}{10}$ cents—the Atchison, Topeka & Santa Fe 2.273 cents.

The passenger traffic on this line is one of its weak factors, and will continue to be until ruinous competition—the germ of monopoly—is subordinated to some authority that will make reasonable rates for the railroads as well as for the people.

The surplus for the four months ending Oct. 31, 1893, was $1,071,559, a decrease under the same period in 1892 of $913,357.

The causes of the bankruptcy were:

1. On account of its vast debt, which is out of proportion both as to the value of the property involved and as to its earning capacity.

2. Undue competition whereby rates were decreased.

3. The unforeseen depression in the silver business and otherwise.

Hard times come periodically, and roads loaded down with debt that can only pay their fixed charges during flush times must go to the wall.

The Atchison, T. & S. F. is one of these, and her only chance in the future is to reorganize by making preferred stock of her junior securities to such an extent that her fixed charges can be paid in bad as well as good times, or submit to an actual foreclosure.

The road has a great future, but its owners must be patient. There are vast areas on its line in New Mexico, Arizona and Sonora that furnish but little traffic now, but much of which will be irrigated and productive within ten years.

S. Y. McNAIR.

Railroad Matters in Chicago.

The Year.—The leading officers of the Western railroads are unanimous in pronouncing the year just terminated the most unsatisfactory one they have ever passed through. General Manager St. John, of the Rock Island said: "It has been a year of hard work, unusual annoyance, and unremunerative results. I have no hesitation in saying that in my thirty years experience in railroading I have never seen a year so barren of satisfaction in proportion to the labor and care bestowed." General Manager Merrill of the Burlington system said: "The year 1893 was beyond question the most disappointing one the railroads have gone through. I hope they may never have another such year." When asked if he thought the World's Fair had benefited the Chicago roads to any extent, he said he had not been able to preceive any advantages of consequence; that the business was done at low rates and the advantages derived had been offset by the extra work entailed. A manager who did not wish his name mentioned said: "The year just closed was the most disappointing, not to say disasterous, twelve months in the history of the railroads traversing the West. Only the roads which were fortunate enough to escape serious accidents derived any profit whatever from the Fair, while those that were unfortunate really lost money. Aside from the heavy expenditures for extra equipments to enable them to handle the Fair traffic, the roads centering here also subscribed over $600,000 to the Fair, and are out to that extent. I am convinced that the Fair was really a detriment to the roads when considered from a financial standpoint."

Freight Traffic.—The only bright feature during the week just past was the large inward traffic of the majority of the lines. The deliveries of grain by the 11 leading roads aggregated 5,298,000 bushels, against 3,929,000 bushels the wdek immediately preceding, 4,203,000 bushels the week ending Dec. 31, 1892, and 3,779,000 the corresponding period in 1891. The miscellaneous tonnage, including flour, aggregated 30,802 tons against 24,725 tons the closing week in 1892. The leading grain roads are also reported to have had a large interior business in that article, which they carried from producing points west of the Mississippi River to connecting points with eastbound roads traversing Illinois south of Chicago. Unfortunately, however, other business was moderate, especially outbound freights.

The general impression prevails in well informed circles that any change for the better is not near. It is predicted in some quarters that the present aggregate of grain traffic will suffer a speedy shrinkage. This opinion is largely based on the apparently plausible theory that the recent cut on freight rates from Chicago to the East caused a rush of grain by Western shippers. Well informed live stock dealers are also predicting very moderate arrivals of cattle the current month, but hogs are expected to increase.

The following table shows the deliveries of flour and grain by the leading roads centering in Chicago, for the week ending Dec. 30, with comparison for the same time last year:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. & N. W.	15,325	1,137,000	25,913	859,000
Ill. Cent.	1,200	701,000	315	405,000
C., R. I. & P.	18 550	540,000	3,750	406,000
C., B. & Q.	16,067	1,321,000	8,786	734,000
C. & Alton	3,450	88,000	1,800	152,000
C. & E. Ill.	150	87,000	150	136,000
C., M. & St. P.	33,7-0	682,000	21,750	590,000
Wabash	1,200	111,000	2,250	67,000
C. & G. W.	15,180	210,000	12,264	248,000
A., T. & S. Fe	.....	408,000	150	316,000
L., N. A. & C.	.....	13,000	.....	1,000
Totals	104,872	5,298,000	77,128	3,914,000

The deliveries of grain and flour at interior points also showed a large increase over the corresponding week in 1892. There was also a gain in the outward movement of coal of 7,098 tons. The movement of other classes of freight in and out was closely balanced with the same week the preceeding year.

The following shows the deliveries of grain and flour at Chicago by the railroads mentioned during the month of December and for the same time last year:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls	Bush.	Bbls.	Bush.
C. & N. W.	74.763	4,127,000	149,046	3,697,000
Ill. Cent.	9,450	2,429,000	1 215	2,139.000
C., R. I. & P.	57,850	1,653,000	17.400	1,467,000
C., B. & Q.	35,904	4 398,000	66 495	4,068,000
C. & Alton	8,100	570 000	7,453	563,000
C. & E. Ill.	750	321.000	450	421.000
C., M. & St. P.	103.903	2,817 000	137,855	2,386,000
Wabash	3,450	491,000	10,500	522,000
C. & Gr't W.	72,627	649.000	101.473	996.000
A., T. & S. Fe	8,200	1,034,000	1,200	1,034,000
L., N. A. & C.	.....	32,000	.....	4,000
Totals	374,994	18,551,000	493,087	17,097,000

The following table exhibits the receipts of flour at Chicago by 11 railroads during the past three years, and the amount brought by each road:

	1893.	1892.	1891.
Chic., R. I. & Pac.	403.779	248,750	121.575
C. B. & Quincy	688.251	868,353	997,704
A. T. & S. Fe	64,524	11,228	18.978
Chic. & Alton	171,377	275,732	200,406
Ills. Central	102,620	26.028	2.054
C. & Northwestern	1,0 4.562	1,290,152	1,206,083
C., M. & St. Paul	1,172.055	1,301,350	1,199.858
C. & East Ills.	6,263	1,897	2,850
Wabash	51.078	139,513	56,233
Wis. Central	58,550	399.500	42,428
C. & Great Western	723,647	1,156,435	482,046
Total bbls.	4,466,716	5,718,938	4,330,215

The following table exhibits the deliveries of grain of all kinds, in bushels, at Chicago during the past three years:

	1893.	1892.	1891.
Chic , R. I. & Pac.	29,099,000	28,651,351	29,219,355
Chic., B. & Quincy	59,284,000	55,776,815	52.961,819
A., Top & S. Fe	13,056,000	13,818,296	13,856,303
Chic. & Alton	9,298 000	10,576,643	9.920,395
Ills. Central	31,781,000	25,152,625	25,774.557
C. & Northwestern	39,561.000	33,923,975	25,393,072
C., M. & St. Paul	32,232,000	29,924,797	26,609,239
C. & East Ills.	6,872,000	6,788.208	5,795,287
Wabash	6,102,000	7,320 830	9,081,223
Chic. & Gt. Western	8,791,000	12,241,136	8,545,932
L., N. A. & Chic.	474,000	650,974	367,763
Total business	238,483,000	225,835,950	208,534,998

Passenger Traffic.—With the exception of a slight increase in travel over the lines leading to Southern resorts, and an enlarged interior local business incidental to the holidays, the past week failed to show any betterment in the passenger traffic over the preceding weeks in December; the almost universal complaint being that business was very small, and the only hope of improvement is that the Mid-Winter Fair at San Francisco will stimulate California travel, but such business is done at very low rates, and should the predicted increase come, the net revenue from it will be moderate. The roads are working as cheaply as possible, and have been favored by the weather. It is said that they have made further reductions in car service by the discontinuance of non-paying trains, and that the saving from that source will make favorable showing in the month's expenses. The General Manager of one line said: "I think the other lines are also unanimous in their opposition to maintaining train service which does not pay, except in case where it is cheaper to do so than fight the commands of railroad commissioners."

Equipment.—The statement printed in a New York journal the past week that the Western railroads had given orders for a considerable tonnage of steel rails for the year just opening cannot be confirmed by statements from either the managers of the railroads or the officials of the rail mills, both of whom are positive in their denials. Every railroad manager seen stated that they were in no hurry to give orders. The officials of the Illinois Steel Company said they had read the statement, but as yet they had not taken an order worth mentioning within a fortnight; they were surprised at the report, which was evidently erroneous. They also regarded prospects for early sales as very blue. A gentleman connected with a large car wheel foundry said that they had secured some good sized orders for wheels, but they were all from roads in the hands of receivers, and added that "they are the only class of roads t could buy anything." Dealers in other description car and locomotive supplies stated that they were unable to secure any orders worth mentioning, although they had offered goods at prices which left profit out of the question. The roads (said a dealer) invariably reply "that they are not in immediate want of goods, and will wait to see how earnings pan out."

CHICAGO, Jan. 1.

TECHNICAL.

Tests of Large Timber.

Some valuable tests of the strength of timber are reported by Prof. H. T. Bovey in Vol. VII., Part I., of the *Transactions* of the Canadian Society of Civil Engineers. These results are from experiments conducted at McGill University to determine the transverse strength of Canadian white pine. The sticks selected were as sound and clear as could be had in the open market. The trees of the first series of tests had been felled in winter, rafted to Montreal and remained in the water until the following fall and tested in the next February.

The sticks were in pairs, each pair having been cut from the same tree, and each original stick was 9 × 18 in., 25 ft. long.

The first test gave an ultimate outer fiber stress of 2,903 lbs. per sq. in., the second broke at 3,555 lbs., a third at about 2,880 lbs., a fourth was only 114 in. long and gave 2,220 lbs., a fifth was 102 in. long and gave 5,900 lbs., a sixth was 10 ft. and broke at 3.312 lbs., a seventh was 10 ft. and broke at 2,500 lbs. The sticks of the second series tested were from a tree felled five years before. lay in the water four years, was taken out of the water in the autumn of 1892 and piled for winter sawing. The tests in March gave the following ultimate stresses in the outer fiber: Two 24-ft. sticks broke respectively at 3,904 lbs. and 3,680 lbs., and four 10-ft. sticks broke at 2,740, 3,000, 3,000 and 3,200 lbs. respectively. The averages for the two tests were each 3,325 lbs. and 3,250 lbs., from which one would naturally infer that the soaking in water had not damaged the latter specimens or that the timber from the Pettewawa district, from which it came, was superior to that from the Gatineau Valley.

Cape Cod Canal.

The Old Colony & Interior Canal Company, better known as the Cape Cod Canal, has passed one danger point in safety. Its charter would have been forfeited on Dec. 30 if it had not filed with the Secretary of State a certificate from the special commissioners approving the issue of $7,500,000 in capital stock, and as much more in bonds. This certificate was secured, and as there was plenty of time for it to be filed last week, it may be assumed that the charter was made safe.

Before the commissioners approved this issue of $15,000,000 of securities they gave hearings to the incorporators of the company and approved the purposes of the company and the terms under which the stock and bonds are issued. The bonds may be secured by first mortgage, covering all the rights, franchises and property of the company now owned or hereafter to be acquired, and shall bear interest not to exceed five per cent. per annum, the principal to be due 50 years from Jan. 1, 1894, principal and interest payable in gold coin. The entire capital stock and bonds are to be deposited with the Old Colony Trust Company, of Boston.

The commissioners have remarkable and probably unprecented powers over the issue of stock and bonds. Within three months the company must deposit $50,000 with the Massachusetts State Treasurer as a forfeit if the work on the canal is not actually begun within one year from the passage of the act, which was June 9, 1893. Within a month after that deposit the company must deposit $150,000 in addition to be used as security for the payment of all damages occasioned by the laying out and construction of said canal. If three-fourths of the trunk of the canal is not excavated by June 1, 1898, then $100,000 of the above $150,000 is to be forfeited to the towns along the line. The canal must be completed within five years, and if the corporation shall fail to fulfill any of the obligations of the act creating it, the corporation shall cease to exist and all right of way, buildings, machinery and other property outstanding in the name of the corporation shall become the property of the state.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

New Railroad Building in 1893.

The railroad building of the past year now appears to be 2,585 miles for the United States. The figures are not likely to be materially changed by later reports. This total shows a considerable though not unexpected falling off when compared even with the last two years, which were poor years for railroad construction. In 1891 4,010 miles were built and in 1892 4,090 miles, and that year included 588 miles on the Pacific extension of the Great Northern. In 1887, the famous boom year for railroad construction, 12,900 miles of railroad was built in this country. So large an addition to our railroad mileage had never been made in any previous year, nor has it been reached or even approached since, by 5,000 miles, and the record is likely to stand unequaled as the greatest amount of track ever built in any single year.

The railroad construction in the six years previous to 1893 is shown in the following table:

1887	12,900	1890	5,350
1888	6,900	1891	4,010
1889	5,200	1892	4,090

The 2,600 miles built in 1893 is only about 38 per cent. of the total for 1889, even; and the *percentage* of decrease from 1892 to 1893 is greater than in any year since the "slump" after 1887.

The decline in railroad building in these years has been the outcome of well-known causes. The outlook at the opening of the year was brighter than at the beginning of the preceding years, but it was a very safe prediction to make in January that the course of railroad construction in 1893 would not be different from the record of the preceding few years, but would continue to be downward. This has been verified to a greater degree than could then be foretold, the financial troubles of the summer having repeatedly developed new complications which impaired the hopes of the most conservative.

Most of the lines on which a considerable length of new track has been laid in 1893 were noticed in our summary for the first half of the year, which was published July 14. The chief of these were the Rock Island line to Texas, the additions to the Missouri, Kansas & Texas at both the northern and the southern ends, and the "Soo" line from St. Paul northwestward to the main line of the Canadian Pacific. Of others worthy of note, the new line to Florida is perhaps the most prominent.

This line, the extension of the Florida Central & Peninsular northward from Jacksonville to Savannah, Ga., makes 114 miles of our total. With the South Bound Railroad, 142 miles long from Savannah northward to Columbia, S. C., which was finished in 1892, and is now owned by the same interest, it makes a connection between the old lines of the company in Florida, reaching the principal points in that state, and the Richmond & Danville; and a new passenger line was opened between New York and Jacksonville on Dec. 25. The advertised timetables indicate that fast time will be made, and one of the two daily trains is a limited express, made up wholly of parlor, sleeping and dining cars. The new extension is substantially built. The track is laid with 70-lb. rails and the important bridges are of steel, and the company seems to be well prepared to compete with the old line. The distance between Washington and Jacksonville is about 30 miles less than by the Atlantic Coast Line.

The Bangor & Aroostook by building into Houlton, Me., has formed a road of 150 miles in Maine, reaching to near the New Brunswick boundary line. The new portion of the line, 95 miles long, northeast from a point above Bangor, lies entirely to the north of the road built across Maine a few years ago by the Canadian Pacific. The new line to Florida, mentioned above, is important because of its connections with other lines. This new line in Maine, on the contrary, will depend but little upon its neighbors. It is to develop a new country, and for that purpose has been well located. Penobscot County, which it traverses, and Aroostook County, in which a considerable portion of the line is located, are rich in natural resources. They have been growing in recent years, and that growth was bound to increase greatly as soon as good railroad facilities were secured. The road is not yet in operation, but already new industries are starting up. Both counties have great forests of standing timber, and when the timber adjoining the line is cut the many streams which the road crosses will bring logs to the line from an extensive section of the state. Water power is abundant, and the establishment of factories is expected to diversify the traffic of the road. Good farming land is abundant in certain sections, and these portions of the line are already settled.

The large share that Pennsylvania has taken for several years in building new railroads has been noteworthy. That state has built over 300 miles a year for four years. This is a greater new mileage than any other state has built in the same period except Washington, which owes its lead to the extensions of the Great Northern. The building of so much new road for several years in a well-populated Eastern state is not due to the enterprise of any one company, of course. No long line is required, for all the chief cities already have good traffic outlets. The record of Pennsylvania is a good illustration of the change that has occurred in railroad building since the days when the great proportion of the track laid was by a few companies in extending their lines across the level prairies of the West.

Of the whole 300 miles credited to Pennsylvania in 1893 not half a dozen companies built more than 10 miles each. The chief line, according to mileage and probably also in actual importance, was the Wilkes-Barre & Eastern, which has been now for several months carrying coal, brought to it at Wilkes-Barre, to the New York, Susquehanna & Western, which takes it to New York harbor. The Clearfield & Mahoning has also since July been serving its purpose, of connecting the Buffalo, Rochester & Pittsburgh, which built it, with the Beech Creek, and giving the bituminous coal mines along the former road a new outlet, the coal now reaching Eastern tidewater over the Beech Creek and the Philadelphia & Reading. The other new lines in the state all develop local industries, and are chiefly in the mining districts, though several lines—the Central of Pennsylvania and others—have their chief purpose in giving better transportation outlets to fertile agricultural districts.

The new mileage of Ohio is made up almost entirely of the extension of the Ohio Southern from Springfield northward to Lima, 67 miles, and of the Toledo & Ohio Central south to Columbus, 50 miles. Both these extensions have been built to strengthen the respective lines as coal carriers. They give the companies a longer haul on coal originating at the mines in southeastern Ohio to western Ohio and points farther north and west, and new and important connections. The Toledo & Ohio Central now brings its coal chiefly from the West Virginia mines on the Kanawha & Michigan, which it controls. The K. & M. built this year 30 miles in West Virginia to connect with the Chesapeake & Ohio.

South Dakota's new mileage is one of the large items of the list, and of this the line from Sioux Falls southward to Yankton, 58 miles long, is noteworthy. It is practically an extension of the Great Northern to the cornfields of Nebraska, and, with other acquisitions of the Great Northern in this region, indicates that that company believes in the importance of a line from Nebraska to Duluth for carrying grain bound for the East.

The 405 miles reported in Canada is a very considerable increase over the mileage built in the previous year (273 miles), but it includes two long lines, the Canadian Pacific line, 160 miles in Assiniboia, built to connect with the "Soo" extension through North Dakota, and the Nelson & Fort Sheppard, an extension of the Spokane Falls & Northern, a Washington road, north to the mines at Nelson, B. C. The average length of all the other lines built in Canada the past year is but 16 miles.

The record of the year, small as it is, gives no indication of the severe depression of the last three or four months. Never, in recent years, has there been so little work in the line of railroad extension under way at the close of the year as we find in a survey of this field at the present time. The number of roads on which 200 men are now at work on new construction is so small that they can probably be counted on the fingers of one hand. All prognostications must wait on the course of general business, the stagnation of which is now so general that no one expects the recovery to be other than very slow. The first signs of returning activity in construction will be seen on those lines where work was stopped when the financial stringency first set in. There are a number of these projects that are in the hands of such strong companies that they will surely be completed to make good the sums already invested. In many cases they are commendable, and with the first brightening of the financial skies they will be taken up.

Railroad Earnings in 1893.

While it is still too soon to know fully the relative falling off in railroad earnings in 1893, we all know that it has been very serious, and we have already data enough to show the course very accurately. On Dec. 16 the *Chronicle* published the gross earnings of 124 railroads to Nov. 30. In 11 months the increase in miles operated was three per cent. and the decrease in gross earnings was 1.3 per cent. This was for a little more than half the railroad mileage of the country. Later returns of nine roads, including some of the largest systems, bring the loss to 1.8 per cent., or about 12 million dollars. It will be borne in mind that the *gain* in gross for the same period in 1892 was 5.7 per cent., in 1891, 6.3, and in 1890, 8.8. The loss is therefore worse than is expressed by the figure of 1.8 per cent. A normal gain is lost besides.

Up to the end of June this normal gain was nearly maintained. In the first six months of the year 143 roads had gained $12,000,000, or 4.6 per cent. over the first half of 1892. The increase in the same period of the years preceding had been 18.6 million in 1892, 8.7, 23.2 and 12.5 in 1891, 1890 and 1889. In July the gross showed a decrease of $1,765,527 for 138 roads for the month, as compared with an increase of $2,258,129 by 143 roads in the month of June. But there was still a gain in the total of the seven months of nearly nine millions. In August the monthly gross earnings had actually decreased 8.4 millions for 130 roads, and the gain for eight months had fallen to $824,000. In September the heavy World's Fair travel had begun to show in the earnings, and the decrease for the month was a trifle less than five millions, as compared with September, 1892; but for the nine months of the year elapsed the total earnings for the first time fall behind, the deficit for 128 roads having been $2,330,000. In October the falling off in monthly earnings was less than in August or September, that is $1,246,000; the decrease for 10 months was $3,240,000. In November the decrease for the month, as compared with 1892, was greater than in October, the effect of the World's Fair travel having nearly ceased. The earnings for the month fell off over 3.3 millions, and for the year over 6.5 millions. Doubtless the December decrease will be still greater, for in addition to the continued depression the effect of demoralized rates will be felt. The preliminary report of the *Chronicle* shows a decline of 4.77 per cent. for 65 roads in the first week of November, and 12.38 per cent. for 59 roads the first week in December. The third week the November loss was 6.74 per cent. and the December loss 12.72.

We have written so far of gross earnings only. In May the net earnings for the month were 2.6 millions more than in 1892, but for the five months the total was $326,000 less. In the month of June the increase is continued, being 6.2 per cent., or $1,036,000. In July, however, there was a decrease of 1.3 million, or 7 per cent., and the seven months showed a small decrease also, in spite of the severe retrenchment of expenses which began four months earlier. In August the decrease was 4.1 millions, or 19 per cent. for the month, and 4.6 millions for the year.

In October the conditions had changed. The net for the month actually increased $331,000 so far as returns collected yet show, but for the year it was 6.9 millions behind 1892. The net results for November cannot be given now, but the course of gross earnings is not encouraging for the net; and December must be even worse in spite of economies.

It is some satisfaction that net earnings have not fallen off as much as gross; to some people this seems

to be a great satisfaction. But we should not delude ourselves. No one has suddenly discovered a specific which will permanently change the ratio between earnings and expenses; any improvement in that ratio must come by the slow working of means which every one knows about, but which, in the strict limits of human life, can only work very slowly. Very much, in fact most, of the economy that we hear so much of now is fictitious. The track, the equipment, and the organization will all be the worse for it; but, of course, it is necessary. Only the rich can be really economical.

Counterbalancing Locomotives—Purdue Tests.

We have received considerable correspondence about the report of the experiments on counterbalancing with the experimental locomotive at Purdue University, and about our editorial on that experiment, both of which were published in the *Railroad Gazette* of Dec. 15. In what follows we give extracts from the letters received, commenting on each point raised as the extracts proceeds:

I am afraid that your statement to the effect that the wheel lifted at speeds from 40 miles and upward is hardly sustained. The variation of pressure is apparent at 40 miles, but the wheel does not actually clear the rail until a much higher rate is obtained, about 59 miles. G.

As we remember the tests showed that the wire was nearly full at a speed of 40 miles an hour, and as the wire had but little resistance to crushing it appeared that the wheel must have lifted at that speed. When the normal weight of the wheel is on the wire, as when the counterbalance is on a dead point, the wire is crushed quite thin: possibly then when the wire is nearly full, as at 40 miles an hour, the wheel lifted somewhat.

You mention that the wire of $\frac{3}{64}$ of an inch was fed between the wheels at the point of contact; that the wire was full for a distance of about 30 in. at a speed of 60 miles per hour or to a corresponding angle of 55 deg.; and that the maximum lift is unknown, but is possibly more than $\frac{3}{64}$ of an inch. Assuming that these are correct, I would like to ask this question. What imparted the power to the wire to enable it to move in the same velocity as the driving wheels did, it not being in contact with the wheels? Was it its own inertia and was not this inertia reduced as the wire came out on the opposite side and curled up, thereby offering a large area to the atmosphere to assist the retardation of velocity? Of course, I may be mistaken, but I am sure that I would base no calculation on such assumption However, I shall never forget this experiment, as it opens a new field for investigation and shows that our knowledge is deficient. S.

Up to the instant that the drivers left the carrying wheels the wire had the same velocity as the circumference of the drivers, after that the wire went forward with the velocity it had acquired less the retardation of the atmosphere as our correspondent has noted. The effect of the retardation must have been small, as the mass of the wire, and therefore its stored energy, was great in proportion to any possible resistance of the air. The fact that the wire did not curl up until it had practically all passed under the wheel, and the further fact that the length of the wire between the marks thereon was practically the same as the circumference of the drivers, both tend to indicate that for all purposes of useful reasoning the wire had the same velocity as the circumference of the drivers at each instant of the time of its passage between the wheels. The time of passage was about one-fifth of a second.

I want to take exceptions to some of the statements, and one is, the indication that it was not known before the Purdue engine was put up that "it was not economical to wire-draw the steam through the throttle." I believe this was well known. Again, you state that "the most perfect counterbalance that can be given to a locomotive is the one which balances the entire weight of the revolving and reciprocating parts." It has long been known that this is the most perfect way to balance an engine fore and aft, and thus to have it jerk the train less; but it has also been known (which you do not here indicate as being a fact) that *it is not* the most perfect counterbalance for a locomotive doing the service of a locomotive, because of the unnecessary increased variation of the pressure of the wheel upon the rail, and I should therefore consider the statement as wrong.

Further, it is stated that "centrifugal action is not, strictly speaking, a force, but is only a tendency, and does not exist unless the wheel is constrained to revolve on a point outside of its center of gravity." I do not believe this is a statement of fact that will bear examination, but that centrifugal *force* exists in every rotating body, whether rotating around the center of gravity or not; otherwise, I would like to know what bursts a millstone when it goes too fast, although it is perfectly balanced? Is it a tendency or a force? C.

The relative economy of running a locomotive with the reverse lever and thus changing the point of cut-off according to the power needed and running it on the more common plan of changing the power by closing or opening the throttle valve is not settled yet in the minds of a good many who have direct charge of hundreds of locomotive engineers. We agree with our correspondent that the economy of varying the cut-off to suit the power required has long been well known, to a few, but no experiments have been published that are so conclusive as those from Purdue University. Even as we write, one of our most prominent locomotive works is advising that its locomotives be run with the throttle lever for all points of cut-off less than six-tenths of the stroke, and not a few master mechanics and traveling engineers teach young runners to close the throttle partially at short cut-offs. Some builders of stationary engines claim to be able to prove by experiment that a wire-drawing throttle governor is as economical at short cut-offs as an automatic cut-off. So far, then, as we can learn from the records of locomotive experiments those at Purdue were the first to show accurately how much the difference there really is under certain conditions between running a locomotive with the reverse lever and with the throttle lever.

As to what makes "the most perfect counterbalance" there should, of course, be no question. It is that which gives the best practical results, all results being considered. If the track is weak and the locomotive heavy the most perfect balance is one that, while it does not make the jerking on the train unbearable, yet does reduce the detrimental effect on the track to a minimum. On the other hand, if the track is strong and able to resist the weight of the engine and the superimposed load from the counterbalances, then the most perfect counterbalancing is that which reduces the jerking of the train to a minimum. When the perfection of the counterbalance is decided by the motion of the locomotive when hung in chains at four corners and allowed to revolve as if on the road, the most perfect balance will be that which causes the least motion, and that will be when "the entire weight of the revolving and reciprocating parts" is balanced. When the perfection of counterbalance is decided by the result on the "riding" of the engine, or the jerking of the train, as is common in this country, then the most perfect counterbalance will be pronounced to be that at which the least "jerking" and "nosing" are produced. This takes place when all or nearly all of "the entire weight of the revolving and reciprocating part" are balanced. But when the perfection of counterbalance is decided upon the grounds of good common-sense and upon mathematical investigation the most perfect counterbalance will be conceded to be that which will reduce the weight of the counterbalance to the lowest possible limit, even at the risk of making the engine slightly uncomfortable for the engineer and the persons in the front cars of the train. To this extent our correspondent's criticism is just, for he would balance his engines with pure reason and "horse sense," and will probably, when he has engines to design, apply some intelligence to the detail dimensions of reciprocating parts.

As to centrifugal "force" or "tendency" existing only when a body revolves on a center outside of its center of gravity, our correspondent is right—and yet he is not. So far as any pressure on external bodies is concerned there is no centrifugal pressure when a body revolves on its center of gravity, and this is the case in point, but within the body itself there is a centrifugal tendency of each unit of mass except the particular unit that finds its center at the center of gravity. All atoms or molecules of the integral mass have a centrifugal tendency relative to each other, but these tendencies balance and the integral body is left without centrifugal tendency, as a whole, when referred to outside bodies or connections (the track in this case) if the body revolves on its center of gravity.

Whether we are correct in preferring "centrifugal tendency" to "centrifugal force" turns on the definition of the term "force." Define this term, and our correctness or our error is apparent at once. This matter has been discussed at great length. See "Recent Advances in Physical Science," p. 5 Tait Lecture, XIV.; "First Principles of Philosophy," Herbert Spencer; *Nature*, Jan. 2, 9, 16, 1879, and Dec. 2, 9, 16, 1880. In "Applied Mechanics," Professor Lanza gives an extended discussion of the subject and finally determines to use the term "centrifugal force." The elementary idea of force is that it is capable of doing work on a body to which it is applied. In the case of revolving bodies, the body moves when liberated not in the direction of the centrifugal "tendency," but in a direction exactly at right angles. If the centrifugal "tendency" had a capacity for work the path of a released revolving body would be modified by the work done upon it, and instead of being a straight line at right angles to the "tendency," it would be in a line resulting from two things: Its velocity in its circular path and the acceleration due to the force, if any existed. This is about as deep into pure definitions as we care to go; those who prefer the term "centrifugal force" may be sure that no one will misunderstand it, while, on the other hand, the term "centrifugal tendency" might be ambiguous under some circumstances. There certainly is an outward "tendency" where bodies revolve, but whether there is an outward "force" seems to depend solely upon definition.

Your account of the visit to Purdue University is very good. I have been reading it to our General Manager, General Superintendent and at the meetings of our shop foremen. I use the wire as an object lesson. I think it specially important that *shop foremen* and traveling engineers appreciate the effect of neglecting counterbalance. They are the men we depend on for carrying out orders, and if they know the reasons they carry them out more intelligently. We would like to see wires passed under the wheels with steam shut off. Our trouble has been mostly going down hill with steam shut off.

Some queries have come up since the article appeared in the *Railroad Gazette* about counterbalancing engines.

1. The valve motion often has much to do with the bad riding of an engine. Several that have seen the wire have said they would like to see a wire from the engine at 60 miles an hour *using steam* and at 60 miles *not using steam*.

2. The wire exhibit has excited the greatest interest at our shops and superintendents' offices. Our trainmasters and traveling engineers now understand why disconnected engines are not to be run fast and why heavy engines with small wheels if run at high speeds will do more damage to the track than engines with large wheels.

3. At one of our principal shops I found engines were being put into service improperly counterbalanced in spite of specific orders that have been issued for each of our classes of engines.

4. It was understood that with the Purdue engine all reciprocating parts and all revolving parts were balanced. We have wondered how the balances were distributed between each wheel and why the forward wheel did not jump as much as the main wheel.

5. We are thinking of making some tests with engines in actual service. This might determine whether the flat spot which develops on certain tires is due to greater pressure on the rail at that point than elsewhere on the tire.

6. May it not be that the pounding on the rail with engines with large wheels, 20,000 lbs. on each driver, is so much less than that of engines with smaller wheels, with 17,000 or 18,000 lbs. on each driver, that there is really no greater damage to the track with the heavier than with the lighter engine?

7. We have been informed that there is a copper wire which will much more accurately measure pressures than annealed iron. Do you know anything about it?

8. It would be interesting if during some of their tests Professor Goss would ascertain and publish the coal consumed and water evaporated with a given load at 30, 40, 50 and 60 miles an hour. This would impress on the minds of students (some may become the managers of our railroads in future) the economy or otherwise of higher speeds in freight and passenger service, and would also enlighten some of us fellows who think the increased coal consumption due to speed *is great*, but don't know exactly *how* great. To find this out we at one time proposed running trial trains with given loads between given points at different speeds. It was never put into effect, however. G.

When steam is used the pull and push on the main crank-pin holds the front or main wheel to the rail at speeds when the back driver lifts, but so far as the pressure on the rail is concerned the pressure is greater with the main than with the rear. The difference being that due to the push on the crank. The wires in the tests were passed under the rear driver, and it was said that the main wheel did not lift so much as the rear driver when engine was running in forward motion with steam on. When running backward the main driver should lift more than the main, for the reasons just given. Professor Goss is carrying on extended experiments under various conditions, and the data will probably be given to the public in the near future.

The counterbalances needed for the reciprocating parts are very nearly equally divided between the rear and main drivers of the Purdue locomotive. There would be nearly the same lifting tendency when the engine is run without steam as when run with it. The effect of the action of the valve motion on the steadiness of the engine is very great; too much compression or to little will make the engine shake and rattle, but the effect on the track is dependent upon the counterbalancing and not upon the steam distribution. A steady engine may be hard on the track, and a rough riding engine may have relatively but little effect on

the track. The relation of flat spots on driving tires to the counterbalance has not been clearly set forth; however, an interesting paper on the subject was read before the Western Railway Club in 1891 by J. N. Barr, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul, and printed in the *Railroad Gazette* Feb. 6. This was supplemented by an editorial shortly after and by a paper by Mr. Herr, published by us June 17, 1892. Experiments such as our correspondent suggests will alone throw enough light on the matter to explain why the flat spots occur as they do without any apparent and sufficient cause. It is certainly quite important to know which of the two conditions, viz. large heavy drivers and heavy engines or smaller, light drivers and lighter engines produce the more detrimental effect on the track when run at equal speed. To learn this we must first know what it is that most destroys the track. Is it the continual passing of many wheels or the severe action of locomotive drivers?

The Railroad Bond Market in December.

There has been a decided change in the bond market since our November report. Then each of the seven groups of bonds showed an average advance ranging from $1.68 to $3.45. This was due to the accumulation of money in commercial centers, a reviving confidence and what was believed to be an improvement in business conditions. The accumulated money naturally sought investment in the better class of bonds. At the time an excellent demand sprang up for the "gilt-edged" issues, and those of a less desirable nature came in for considerable attention, rendering the entire market strong. The advance in the bond market was concurrent with considerable strength in the stock list, due to the repeal of the "Sherman" silver law and a halt in the industrial depression.

Since that report business conditions have become worse, as directly reflected by the falling off in railroad gross earnings. Even the most rigid economy has failed to offset these decreases so much as to keep net earnings up to last year's standard. The stock market has been quick to reflect this condition by lower prices. The decline in the better grade of stocks such as New York Central, Lake Shore, St. Paul, Burlington, Rock Island and Pennsylvania has been very sharp. With the decline came the idea that dividends on certain stocks were in danger; that in some instances railroad securities were becoming less and less desirable as investments, and that certain stocks, unless a change for the better came soon, must either reduce or pass their dividends. This decline in the stock market naturally stopped the purchase of railroad bonds, as it created timidity and strengthened the belief that the worst had not yet become known.

About this time the Atchison receivership was announced. A receivership for a system of almost 10,000 miles of lines and an immense mass of securities outstanding, which had an international market, was unable to raise something like $2,500,000 for January interest, the only pressing claim—this was a settler to capitalists and put a prompt stop on bond purchases both here and abroad. The receivership, coming after a series of others and at a period when it was believed the worst was known, was the most serious blow that American securities have suffered in Europe during the year. The receivership showed how useless is the eighty odd million dollars surplus reserve held in the New York banks as a factor to relieve financial distress.

The bond change in November is shown by the table.

Roads in receivers' hands	— $4.51
Granger lines	— .242
Trunk lines	+ 1.075
Transcontinental lines	— .906
Southern lines	— 1.125
Southwestern lines	— 4.125
Coal lines	+ 1.018
Miscellaneous bonds	— 3.305

We find that of the seven groups given, but two, the trunk lines and the coal lines, show an advance, while the declines in the other five are more or less serious.

The receivers' group has been increased by eight issues of Atchison securities, all of which show very radical declines, the minium being 5⅞ on Atchison 4's to 12 on St. Louis & San Francisco 4's. The A, B, and C series of the St. Louis & San Francisco issues, notwithstanding the fact that they show a decline of some 6 to 7 points, are still quoted at about par, showing that compared with Atchison 4's at 68 or the 2ds at 32 they are a good security. This is the case where an underlying security of the leased line is a better lien than a consolidated security of the line which does the leasing. Northern Pacific issues were comparatively quiet, barring the Northern Pacific & Montana 1sts, which declined 20 points on default of interest. The Northern Pacific 1sts received their interest. They are quoted at 110; none of the underlying securities receive interest. The Reading issues suffered in sympathy with the stock, all scoring material declines. This was on a story that $15,000,000 would be required to reorganize the property, and that the bondholders would be asked to make certain sacrifices, as well as the stockholders.

Union Pacific issues showed weakness, especially the junior securities. A month ago our report showed an advance based upon the idea that the reorganization would assess the stock, and let the bonds alone. The gold note 6's during the month show a decline of 4 and now take their place as a second-class security. The Oregon Short Line 6's declined 13 on the unenviable relation which that company bears to the Union Pacific. The same can be said of the Fort Worth & Denver City 1sts, which had a decline of 14.

The quotations of many of the issues made by roads in the hands of receivers reflect the probabilities of interest payments. This list must of necessity be materially changed in the course of the next six months or a year. The reorganization period which they are now entering upon will scale many. Others perhaps will be practically wiped out, while still others may remain intact. Issues not now paying interest, but whose prospects are fairly good of being preserved, would under a reorganization plan be brought from say 70 to par. This will undoubtedly happen to a good many of the issues in the accompanying list. An investor who proceeds with caution and intelligence will undoubtedly be able to pick up a good many bargains.

The granger lines show only a slight decrease for the month. Net earnings have decreased materially. This has had little or no effect on bonds, as the various lines are dividend payers, and such dividends stand between bonds and default. The bonds quoted in this list are regarded among the very best railroad securities. They fluctuate but little and are hardly indicative of the general market, owing to the fact that transactions are limited and that they are very closely held.

The trunk lines, despite the rate war which has gone on during the month, show a slight advance. The fact that friction of that nature does not disturb the value of the securities shows the stability of the roads and reflects a very stable earning capacity.

The transcontinental group, owing to receiverships, has lost almost every issue except those of Great Northern. This company's securities are fairly strong, although the Montana Extension 4's lost some 2½ per cent. The same state is noted in the Southern group, the only issues being those of Louisville & Nashville. Results of the past four weeks have made it probable that Louisville will pass its semi-annual dividend payable in February. The stock of the company has declined 10 points in that time. This weakness has been reflected in its bonds, although the decline has not been as materially pronounced. The Southwestern group shows an average decline of 4.125, the greatest. The business of the Southwest is in a demoralized condition and railroad earnings have been reduced to so low a point that at least two systems, and perhaps three, are a little better off than roads that are now under the protection of the courts. Investors understand this perfectly, and have discounted it by lower prices. The Missouri Pacific issues, notably the Iron Mountain 5s and the St. Louis & Southwestern 2ds were the weakest.

The coal group showed a net advance of the month. This was due to a remnant of the investment demand. The coal trade is in a very unsatisfactory condition, but this is as yet only temporary in its nature, and unless it becomes more pronounced and promises lasting qualities, it will not have an effect upon the bonded securities.

In the miscellaneous group, among the largest declines we note the Brooklyn elevated railroads. Brooklyn Elevated 1sts declined eight per cent.; Union Elevated, seven and one-half per cent., and Kings County, 1sts, three per cent. This was due to the falling off in earnings caused by the trolley line competition. The Peoria, Decatur & Evansville 1sts and 2ds, with a decline of 10 and 11 points respectively, are thought to reflect a receivership for that company. The Louisville, New Albany & Chicago 4's with a decline of 10⅞ per cent. reflect liquidation.

The table follows. In order to obtain a comparison of the advances or declines with those of a month ago, the issue of Dec. 1 should be consulted:

Roads in the Hands of Receivers.	Range for December. Highest.	Range for December. Lowest.	Last sale.	Change from last sale in November.
Atchison 4s	76¼	64	68	— 5⅞
" 2d	41¼	30	31⅞	— 8⅜
Atlantic & Pac. 4s	58½	45	46	— 12
Colorado Midland 4s	46	25	30	— 13½
St. L. & S. F 2d A	107¾	100	100½	— 6½
" " 2d B	108	99½	100⅝	— 6⅞
" " 2d C	107¾	93¾	100½	— 6
" " 4s	51	40	40	— 12
Erie 2ds	78½	74	74½	— 1
East Tennessee	90	88½	89½	— 1
Northern Pac. 1sts	111	109½	110	— 1
" " 2d	89⅛	88	89	— 1
" " 3d	68	65	65	— 2½
" " 5s	34¾	27¼	28¾	— 3¼
Northern Pac. & Montana 1st	48½	30	30	— 20
Chicago & Nor. Pac. 5s	47	41¼	43	— 5½
Reading 4s	73	67	68¼	— 4⅛
" 1sts	35½	29	30⅜	— 4⅞
" 2ds	24¼	18½	19¾	— 5¼
" 3ds	19¾	15	15	— 4¾
Union Pacific 1sts, '96	105	103	103	— 1⅜
" " " '97	105¼	104½	104	— ¾
" " " '98	106½	104	105	— 1
" " " '99	107	106⅜	106⅞	—
" " gold notes 6s	91⅞	88	88	— 4
U. P., D. & G. 1sts	47½	40	40	— 4
Kansas Pacific cons. 6s	94	87¾	87¾	— 2
Ore. Short Line & U. N. con	51	49	49	+ ¼
Ore. Short Line 6s	90	74¾	75	—13
Ore. Ky. & Nav. 1sts	106⅛	103	104	+ 1½
Ft. Worth & Den. City 1sts	72⅞	67	67	— 4
Rich. & West P. Ter. 5s	20½	18	18	— 3
" " " " 6s	45	40	40	— 5
Richmond & Danville 6s	110½	109	109½	— 1½
W. N. Y. & P. 1sts	104	102	102	— 1
" " " " 2ds	24	20¼	20¾	— 3¼
Average net decline, 4.51.				

Roads in the Hands of Receivers.	Range for December. Highest.	Range for December. Lowest.	Last sale.	Change from last sale in November.
Grangers:				
Chic., Burl. & Q. conv. 5s	103¾	101	101	— 2⅛
" " " 7s	123½	121¾	122⅛	+ ⅛
" " " deb. 5s	99¼	97	97	— 2¼
Rock Island ex. 5s	102½	99¾	100	— 2
" " deb	95	92¼	92¼	— 2¼
St. Paul 1st 8s	117	116⅛	117	+ 1
" Dak. & Gt. So. Div. 5s	105	104½	105	....
" Terminal 5s	107⅛	107⅛	107⅛	+ ⅛
" Chi. & P. West. 1st 5s	110	109⅛	109½	— ½
" general 4s	94	93	94	+ 2
Mil. & Nor. 1sts, 1910	113½	112⅛	113¼	+ ⅝
" " " " 1913	112¾	112½	112½	— ¼
Northwest S. F. 5s	109	107½	108	+ 1
" Con. 7s	139	138	138	.....
" 25-yr. deb	104¾	102⅛	104¾	+ ¾
Average net decline, .242.				
Trunk Lines:				
Pennsylvania 4½s	110	110	110	+ 1⅛
N. Y. Central 1st 7s	125¾	125½	125¾	+ ¼
Beech Creek 1sts	102	101½	101⅞	+ 1⅛
Rome, W. & O. ex. 5s	114	112	113¾	+ 1¾
West Shore 4s	104⅛	103⅝	104	.....
Average advance, 1.075.				
Transcontinental:				
St. Paul M. & M. or Great Northern:				
St. Paul M. & M. con 6s	120	119¼	119¼	— ⅝
" " " 4½s	101¾	101	101	— ¾
" " Mon. Con. 6s	114½	113¾	113¾	— ¾
" " Mon. ex. 4s	90	89	89	—2½
Average decline—.936.				
Southern:				
Lou. & Nash. gen. 6s	113	110	110	—3
" " gold 4s	78¼	75	75	—2
" " con. 7s	110⅛	110	110⅛	+ ⅛
Average net decline, 1.125.				
Southwestern;				
Int. & Great Northern 1sts	111¾	109¾	110½	— ⅛
Kan & Texas, 4s	81	77⅛	78	—2¾
" " " 2ds	46½	43½	44	—3⅜
Iron Mountain 5s	79½	72	72	—8
St. L. & Southwestern 1sts	61½	55	56½	—3¾
" " " 2ds	20	15⅛	16	—6⅛
Texas Pacific 1sts	78	72½	73	—4¾
" " 2ds	22⅞	18	18¼	—4⅛
Wabash 1sts	103¾	102¼	102⅛	— ⅜
" 2ds	78	72	72¼	—6¼
Average net decline, 4.125.				
Coalers:				
Lackawanna 7s	132½	127	131	+1
N. Y., Lack. & W 1st	130⅝	130	130½	+2
Del. & Hudson '91	104⅜	103⅞	104⅜	+ ⅛
Albany & Susq. con. 7s	128½	127½	128½	+ ½
Jersey Central gen. 5s	124	112	113½	+1
N. Y., O. & W. 4s	84¾	82¼	82⅛	—2
" " " " " con. 5s	107¾	106⅝	107½	+1⅛
Average advance, 1.018.				
Miscellaneous:				
Brook. Elev. 1sts	105¾	100	100	— 8
Bur., C. R. & N. 1sts	102½	101¼	101¼	— 1
Ches. & O. 6s, 1911	117¼	116	116	.....
" " con. 5s	103⅛	101½	102	— 2
" " gen. 4½s	77¾	71	71½	— 5⅞
" " R. & A. 1sts 4	86½	85	86½	+ 2
" " " " 2-4	86½	84	85	+ 1¼
Can. South. 1sts	109½	108	109	+ ½
" 2nds	103	101¼	103	+ 1
Chi. & E. Ill. gen. 5s	99⅞	98	98¾	— ⅞
Chi. Gas L. & C. 1sts	89¼	86½	88¼	— 3¼
Den. & R. G. 4s	80¼	78	78	— 2
Edi. E. Ill. 1sts	105	102¾	102¾	— 1¾
Gen. Elec. deb. 5s	75½	70	71	— 2
Hock. Val. 5s	90	86	86	— 5
" 6s	93½	83½	83½	— 6½
King's Co. Ele. 1sts	87	82	82	— 3
Laclede Gas 1sts	85	80	80¼	— 4¼
L. E. & St. L. 5s	63	60	61½	— 5¼
L., N. A. & C. con. 6s	101⅞	95	95½	— 5
" " " " gen. 4s	71½	60	60	—10⅞
Mobile & Ohio gen. 4s	63½	58½	58½	— ½
Ore. Imp. 1sts	99	98	98	— 2
" " 5s	56⅜	49	49	— 6⅞
Peo., Dec. & E. 1sts E. div	80	75	75	—10
" " " 2ds	37	24	24	—11
Peo. & East. 1sts	74	71	73	+ 1¾
Pitts. & West. 1sts	88	86½	86¾	— 1¼
Rio. G. West. 1sts	73½	69	69	— 3⅝
San A. & Ar. Pass. 4s	58¾	53	53⅛	— 5⅝
Third Ave. 5s	115½	113½	113½	— ½
Union Elevated 1sts	100½	94	94	— 7½
Average net decline, 3.305				

It appears that the Receivers of the Northern Pacific, in their action to prevent a strike, applied for an injunction at St. Paul as well as at Milwaukee, and a similar injunction was served on the Pacific Coast. The St. Paul injunction, and perhaps the others, was issued about Dec. 18, but was held in abeyance, because the Receivers expected to come to an agreement with the complaining employees. In enumerating those who are enjoined from striking or ordering strikes, the petition of the Receivers mentioned the names of 23 men who served on the conference committee with the Receivers, and asked that they be enjoined from ordering a strike, which the court grants. The petitioners say that the employees cannot carry on a strike without the pecuniary assistance of the different national organizations to which they belong. It is therefore asked that these organizations, through their chief officers, P. M. Arthur, E. C. Clark, E. P. Sargent, D. G. Ramsey, S. F. Wilkinson and others, be enjoined from ordering and sanctioning the strike. The court grants this, and these men are included in the injunction. Press dispatches report that the injunction has been served on the men named Mr. Sargent is quoted as saying that he is enjoined "from even communicating with employees of the Northern Pacific," but this seems to be putting it too strong. The principal paragraph of the St. Paul injunction reads:

You are hereby strictly charged and commanded that you, and each and every one of you, do absolutely desist and refrain from disabling or rendering in any wise unfit for convenient and immediate use, any engines, cars or other property of Thomas F. Oakes, Henry C. Payne and Henry C. Rouse, as Receivers of the Northern Pacific Railroad Company, and from interfering in any manner with the possession of locomotives, cars or other property of the said Receivers or in their custody, and from interfering in any manner, by force,

threats or otherwise, with men who desire to continue in the service of said Receivers, and from interfering in any manner, by force, threats or otherwise, with men employed by said Receivers to take the places of those who quit the service of said Receivers, or from interfering with or obstructing in any wise the operation of the railroad or any portion thereof, or the running of engines and trains thereon or thereover as usual, and from any interference with the telegraph lines, . . . and generally from interfering with the officers and agents of said Receivers or their employes, in any manner, by actual violence or by intimidation, threats or otherwise, in the full and complete possession and management of the said railroad, and of all the property thereunto pertaining, and from interfering with any and all property in the custody of the said Receivers, whether belonging to the Receivers or shippers or other owners, and from interfering, intimidating or otherwise injuring or inconveniencing or delaying the passengers being transported or about to be transported, . . . or preventing the shipment of freight or the transportation of the mails. . . .

The injunction issued by Judge Jenkins, at Milwaukee, is said to restrain the employes and the unions from "combining and conspiring to quit with or without notice the service of the road with the object of embarrassing or crippling its operation, and generally from interfering with the officers and agents of the Receivers. . . . " The substance of these injunctions will probably be approved, even by the labor leaders, except Judge Jenkins' command not to "combine . . . to quit with or without notice." The other clauses of the injunction are aimed at acts universally admitted to be unlawful. But the leaders of the employees complain, of course, at the issue of the injunctions at all. It is true that obstructions of traffic and assaults on trainmen are generally perpetrated mostly by rowdies outside the ranks of strikers, but there has hardly ever been a strike of any extent where employees did not openly encourage lawlessness and where some of them, at least, did not give lawbreakers definite aid. This well-known fact is sufficient justification for the injunctions, unless the Northern Pacific employees are of a higher grade than those on all other roads where disputes of this kind have come into prominent notice. If, indeed, they are so eminently law-abiding that the injunctions constitute defamation of character they will doubtless have no difficulty in getting public disapproval of the judges' acts. The judicial injunction not to combine to quit opens a delicate question which cannot be decided by theoretical reasoning. It may never come up in such a direct way as to require settlement. If it does it will probably have to go to the Supreme Court before any conclusion will be reached that will greatly affect any one's action.

The end of the year always brings a dull market in the iron and steel trade, even in normal times, and this year it was expected that trade would be even duller than usual. Very little business has been done throughout the country when compared with that of former years; but when compared with the past few months the complexion of the market is better. Producers and consumers of iron and steel are not looking forward to a boom, but they are expecting an increased business in the first few months of the new year. Better symptoms were noted in December and still better promise for January. Pig iron was never lower than was quoted last week, notwithstanding all reports of the firm attitude of furnaces and the increased demand from cast iron pipe and stove works. Bessemer pig sold at Pi tts burgh below $11, and one sale is reported at some figure below $10.75. Neutral gray forged is quoted at $10.00, and No. 1 foundry at $11.75 to $12.00. Agricultural works are said to be doing more than at any time since the panic; some Western car shops have taken orders that have given some trade; the iron pipe foundries and stove works are doing a good business, but jobbing and machine foundries are with few exceptions doing little or nothing. No new business of any consequence is reported in steel rails. They are quoted at $24 80 at tidewater, $24.00 at the Pittsburgh mills and $26.50 at St. Louis. Some orders are reported at Chicago, but the tonnage is small; prices are $25 to $27, according to quantity. Structural iron prices are still greatly demoralized, and Pittsburgh, more than ever, holds the key of the situation. Her mills have invaded every market and it is reported that work will be taken regardless of profit or even of cost, if necessary to fill the mills and keep them going. The new scale of wages at Homestead gives further advantage to those mills. The contracts taken during the past two months will be executed under a schedule of wages much lower than heretofore paid. It is believed by many, however, that the lowest notch has been reached on plates, angles, beams and channels, which may lead to more buying. The prices for beams and channels at Pittsburg is 1.45c. to 1.60c., angles and universal plates 1.45c. to 1.50c.

Messrs. Drexel, Morgan & Co. have issued a prospectus of a scheme for the Erie reorganization. It is proposed to issue a new five per cent. mortgage, covering the property of the Erie proper, its lease of the N Y., P. & O. and the capital stock of the Chicago & Erie; that is, covering the entire system. Of this 70-million mortgage, 33⅓ millions will be used to acquire the existing second consolidated bonds, 4 millions will be used to acquire the funded coupons of '85, nearly 10 millions for subscription by depositors of second consolidated bonds, 6¼ millions to acquire or provide for the present reorganization first lien and collateral trust bonds, and nearly 15⅓ millions will be set apart for construction, equipment, acquisition of new property and betterments, to an extent not to exceed one million a year. The new bonds will be exchanged for the second consolidated at par, conditioned on the depositor paying in cash, at 90 and interest, for additional new bonds in the proportion of $1,000, such new bonds for each $4,000 second consolidated deposited. The same stipulation is made in case of the funded coupons of '85. The prospectus says that a mortgage of this character can be issued "without at present increasing the fixed charges of the company, and would therefore be well within the earning capacity of the property if its legitimate construction acquirements are fairly provided for." It is not obvious how the new plan will not increase fixed charges; but the cessation of interest on loans and various forms of unfunded debt will probably keep the fixed charges within present limits for a while. It appears to us that the plan offers exceedingly liberal terms to the holders of the second consolidated bonds, and that if they do not accept it they will make a mistake, for it is hard to see how anything more favorable to them could be financed. They lose one per cent. interest, but they acquire not only foreclosure rights, but a security as good as, and in some respects better than, what they now have. They ought to thank their lucky stars that the chance arises to refund their holdings on such terms. As for the Erie—well, this will put off the deluge another 10 years, if it goes through.

In those parts of the country where cattle roam at will and their owners attend Populist conventions instead of making fences, the railroad Superintendent has a hard time of it. The bills approved and sent in by the cow coroner make a discouraging total at the end of the year, and use up a good deal of money that is needed for the necessaries of life. The tenderfoot Superintendent of the Eastern States knows nothing about it. Down in Alabama lately a dissatisfied cattle owner took his case into court, and lo! the Judge decides that trains must be run, at night, at such speeds that cattle can be seen in time to stop before running over them! This decision will be found in our Railroad Law column this week, the sixth case. In view of the fact that a locomotive headlight will make a dark colored animal visible only about 300 ft. away and that ordinarily from five to ten times that distance is allowed for stopping a train, we must conclude that this Judge does not travel much at night, or that, if he does, he does not care whether he reaches his destination the next morning or the morning after. Possibly he likes to ride fast as well as the rest of us, but issues this dictum with a view to booming the electric headlight. Those Alabama steers probably went up and took a nap on the roadbed because it was higher and dryer than the mosquito infested swamps in which they were supposed to pass the night, and the crime of the railroad manager was that he built a good roadbed. In a Mississippi case, however (the seventh in our reports), a more cunning sort of evil-mindedness was manifested; the railroad manager put salt on the track, so as to entice into danger a big black bull, which without that temptation would have had never a thought of suicide and would have been living and attending to his business to-day. We are glad to note, however, that the higher court disallowed the infamous claim made in this case, and the use of salt to thaw out switches is still lawful in the frigid clime of Mississippi.

A plan has been proposed by M. Bartissol, Contractor of Public Works, for turning a portion of the unfinished Panama Canal to account, which has apparent merit. As is generally known, the port of Colon is not only inaccessible during northwesters, but when the storms are violent vessels at the wharf are compelled to cast off and put to sea to avoid damage to themselves and to the pier. On the Panama side vessels lie at anchor far out in the bay, and all cargo has to be lightered to and from the city. What M. Bartissol proposes is to utilize the portions of the abandoned canal for improved harbor facilities. Four miles on the Panama side, and about 14 miles on the Colon end could be used for this purpose. Vessels could thus have safe harborage, and cargo could be transferred directly from the steamers to the cars of the Panama Railroad. M. Bartissol has submitted his plan to the tochnical commission which visited the isthmus in 1889, and, if approved by them, the liquidators, Messrs. Monchicourt and Gantron, will probably agree to the undertaking, subject to the condition that a corporation, to be known as the New Panama Canal Interoceanic Company, shall be organized with a subscribed capital of 60,000,000 francs by Jan. 31, 1894. The mixed system of transit proposed must also be in operation within two years from the signing of the contract.

TECHNICAL.

Manufacturing and Business.

The Youngstown Bridge Co. has filed a charter at the State Department, Nashville, Tenn.

The Ohio Falls Car Manufacturing Co. has declared a quarterly dividend of 2 per cent. on its preferred stock, payable Jan. 2.

The office of Charles S. Clark, Sales Agent of the Pennsylvania Steel Co. at Boston, has been removed from 70 Kilby street to 8 Oliver street, Boston.

The firm of George J. Burkhardt's Sons, of Philadelphia, has been dissolved by mutual consent, W. H. Burkhardt withdrawing. The business will be continued by Miller Burkhardt and Howard F. Burkhardt under the old name.

The San Francisco Bridge Co. assigned on Dec. 27. The liabilities are given as $238,000; assets, $500,000. The failure was due to the inability to realize on its assets and the loss of $35,000 by the breaking up recently of a raft of logs off the coast of Oregon while on the way from Coos Bay to San Francisco.

The Lehigh Valley, the "Big Four," the New York, Ontario & Western, the Fall Brook, the Connecticut River and the Boston & Albany railroads are now using the Sewall steam heating couplers as their standard. The Consolidated Car-Heating Co. reports a sale of over 10,000 Sewall couplers in the present season.

Henry T. Bronson has been appointed Receiver in supplementary proceedings for Neil Macdonald, railroad contractor, of No. 6 Wall street, New York. Mr. Macdonald was a partner in the firm of William V. McCracken & Co., railroad contractors, No. 40 Wall street. Mr. Macdonald claims that the firm owes him over $250,000.

The officers of the National Switch & Signal Co., of South Easton, Pa., announce its temporary embarrassment. A reorganization will at once be effected. Liabilities are put at $130,000 and the assets, after canceling the $50,000 mortgage, about $25,000. The foreclosure of the mortgage has begun. The works have been shut down.

The Pan-American Investment Co. asks a charter from the Legislature of Virginia. The incorporators are Lawrence Gardner, Stilson Hutchins, William B. Gurley, James E. Jouett, Jesse B. Wilson, Ellis Spear, A. S. Greene, F. W. Pratt, W. D. Colt, C. F. Z. Caracristi, all of Washington, D. C., and James C. Campbell, of New York.

The Clayton Air Compressor Works, of New York, report that its Brooklyn factory is working full time and to its full capacity despite the present dull times, and, indeed, the company is behind on its deliveries. Several valuable patents have recently been taken out on a new triple compound high-pressure air or gas compressor used largely by manufacturers of carbolic acid gas.

The Lidgerwood Mfg. Co., 96 Liberty street, New York City, has just completed for Messrs. Smyth & Munford, Point Pleasant, W. Va., the largest Locke-Miller cable-way in existence. The span which is 1,505 ft. 6in. long, is erected over the Kanawha River and so high that steamers pass underneath it at highest tides. The main cable is 2½ in. in diameter, and the load carried is four tons. The cableway spans the lock and dam in the river which Messrs. Smyth & Munford are to build and the quarry from which they receive their stones.

William V. McCracken made an assignment last week as liquidating partner of the firm of W. V. McCracken & Co., railroad contractors, of 40 Wall street, New York City, to Theodore L. Frothingham. W. V. McCracken & Co. constructed several railroads in the West, including extensions of the Missouri Pacific, the Toledo, Saginaw & Muskegon, and the Louisville, St. Louis & Texas, of which Mr. McCracken became President. The road went into the hands of a receiver last summer. The firm went into liquidation in 1891.

The largest day's production of wire nails ever turned out from one establishment was, according to the *Iron Trade Review*, 5,652 kegs, by the H. P. Nail Company, of Cleveland, a short time since. The selling price of these nails was $1.20 per 100-lb. keg in carload lots. At this rate profits can only be realized by a large output, the gross receipts for the nails and kegs having been $6,782.40. Whatever the holding power of a cut nail may have been proved at Waterville, it is doubtful if they can hold such a price as the above.

The Berry & Orton Co., of Philadelphia, Pa., manufacturers of woodworking machinery, were last month forced to make a general assignment for the benefit of creditors. This company has been in business for nearly 25 years, and during this time has stood in the front as makers of carbuilders' machinery. The present business depression found them with heavy fixed charges, and inability to collect outstanding accounts, together with an unwillingness on the part of one of their stockholders to consent to a reduction of expenses, which made an assignment necessary. We are informed by the General Manager, Mr. Baker, that they should have had no trouble to pay all accounts as they became due, but for the action of this stockholder. A meeting of creditors was called for Jan. 2. From present indications no objection will be made to granting an extension on their indebtedness, and they expect to resume at an early date, of which notice will be given in these columns.

Iron and Steel.

The Mahoning Rolling Mill Company, of Danville, Pa., went into the hands of a receiver last week. A. S. Patterson, President of the company, was appointed Receiver.

The Joliet plant of the Illinois Steel Co. closed on Dec. 31 for an indefinite period. The action throws out of employment 1,000 men.

The Edgar Thomson Steel Works, at Braddock, Pa.,

will resume work this week, a settlement of wages question having been agreed upon.

The Bethlehem Iron Co. on Jan. 1 reduced the wages of the steel mill employees and furnacemen from 50 to 30 per cent.; the reduction is affecting about 1,500 employes.

The Benwood plant of the Wheeling Iron & Steel Co., of Wheeling, W. Va., have been rebuilt and will be put in operation this month. The new plant has a capacity double that which it had before the alterations were made.

The Bessemer and rail-mill departments of the Maryland Steel Co., at Sparrows Point, shut down on Saturday last for an indefinite period, owing to a lack of work. The blast furnaces will continue in operation another week, when they too will shut down. The construction and marine departments of the company will continue running on full time.

New Stations and Shops.

The Baltimore & Ohio shops at Martinsburg, W. Va., which have been closed for several months, have resumed in full. They are working upon new work and repairs.

The new shops of the Southern Pacific at Ogden, Utah, are practically completed. The machinery is being placed in position, and it was expected to start up the works this week. They will probably be in full operation in two weeks.

Experiments with Torpedo Boats.

Some experiments were conducted lately at Newport to determine the effect of explosions upon life in a submarine torpedo boat. A Lay torpedo boat about 30 ft. long, was submerged 15 ft. in 50 ft. of water. In it had been placed two cats, two pigeons and two rabbits. An improvised torpedo, consisting of 76 lbs. of wet guncotton, was submerged at an equal depth, 431 ft. away, and exploded by electricity. The local effect of the explosion was very heavy, the water being widely disturbed with marked bottom reactions, as shown by an upheaval of dirty water. On going to the boat, large bubbles of air were found rising, which indicated that it was sinking or had sunk. It is not believed to have collapsed, but the plating had probably been ruptured. The boat was estimated to be able to stand a pressure of 80 lbs. per square inch.

Concrete Highway Bridge.

At Erbach, Wurtemberg, a highway arch bridge has been built in concrete, with a span of 105 ft. and a rise of arch of 13 ft. To prevent the cracking of the arch and to render harmless any yielding of the abutments, which are placed in a soil not wholly reliable, a 1-in. layer of asphalt has been inserted in the key of the arch and a ⅝-in. layer at each skewback. After the arch had settled 3⅝-in., the three layers had been compressed to a uniform thickness of ½ in. The concrete consists of one part cement, two parts sand, six parts gravel and one-half part of broken limestone.

Arlberg Tunnel.

Along the Arlberg Railroad a new tunnel 446 meters long has been built, having become necessary through the fall of an avalanche in July, 1892. A fortnight after the disaster a temporary line was built, but it took 10 months to complete the safe tunnel, which insures the line for all time against similar disasters.

Chemical Examination of Cement.

Prof. Thomas B. Stillman has a valuable paper in *The Stevens Indicator* on the chemical and physical examination of Portland cement. One of the most valuable features of the paper is a scheme for the analysis of Portland cement set forth on a sheet like the chart diagrams prepared for chemical laboratories. It is in such form that any young engineer can go into a laboratory and make his analysis of cement without further instructions. The professor explains the effect of the chemical constituents of cements on their strength and endurance and gives special prominence to the chemical tests of cement together with the results of numerous analyses of different kinds of cement. The paper also takes up the mechanical tests of cement, illustrating several modern machines for testing.

The Tower Bridge, London.

The Engineer (London) of Dec. 15 is mostly given up to a description of Mr. J. Wolfe Barry's Tower Bridge. Thirty-two pages are occupied with the text and many illustrations, showing the bridge from beginning to end; and a beautiful drawing of the bridge and its neighborhood is reproduced as a supplement. We cannot attempt any extracts from this article or condensation of it, but mention it for the information of those of our readers who do not habitually see *The Engineer*.

Large Testing Machine.

The largest power testing machine ever constructed in the United States was lately erected by the Riehle Brothers Testing Machine Company, of Philadelphia, at Cornell University. It is a vertical screw power machine of 400,000 capacity and will test specimen bars 10 ft. in length. It is adapted for making both tensile and crushing tests.

A Tire Record.

The Midvale Steel Company sends us the following:

"We have just received a report from the West Shore Railroad giving the mileage made by a set of Midvale tires on engine No. 47. This engine is of a four-wheel type, weighing 94,500 lbs., weight on drivers 62,500 lbs.; wheels, 68 in. diameter. New tires $3\frac{5}{16}$ in. thick were applied April 15, 1890, and after turning, in November, 1893, were $2\frac{5}{8}$ in. thick, showing a net reduction of $1\frac{1}{16}$ in., which included natural wear, brake wear and loss of metal in turning. Total mileage made to first turning, 261,733 miles, equivalent to 23,794 miles to $\frac{1}{16}$ in. loss of metal. The engine is engaged in through passenger business and doubles the division of 150 miles daily (Sundays excepted) and makes all stops. We do not see any reason why this set of tires should not make 500,000 miles before they are worn out if the engine is as carefully handled in future as it undoubtedly has been while in charge of Messrs. Kennedy and Keach. We should like to hear of a better record than the above."

THE SCRAP HEAP.

Notes.

The Delaware, Lackawanna & Western has notified 50 men in Wilkes-Barre of their discharge for not paying their debts.

The Baltimore & Ohio Relief Department is to be extended over the lines of the Pittsburgh & Western, which is controlled by the Baltimore & Ohio.

The Cleveland & Marietta has, after timbering about 400 ft. of the Kimbolton Tunnel, which burned out last summer, abandoned the work and a new tunnel is being cut through the hill.

The car shops of the New York, New Haven & Hartford, at New Haven, are now running on full time. Those of the New York & New England, at Norwood, Mass., were closed Dec. 29 with no announcement as to when work would be resumed.

The Lehigh Valley road has terminated its contract with the Central of New Jersey for the use of the terminal passenger station at Jersey City, and its passenger trains now run over the Pennsylvania between West Newark and Jersey City.

In the South Carolina Legislature a bill has been introduced prohibiting the running of all trains, including mail trains, on Sunday. In the Virginia Legislature there is a bill requiring that the members, and also the judges of the courts of the state, be carried free.

Receiver William H. Truesdale, of the Minneapolis & St. Louis, was arrested at Minneapolis last week on a warrant sworn out by Representative Pray, charging him with a violation of the Minnesota law requiring railroads to redeem the unused portion of mileage books. Mr. Truesdale pleaded not guilty and was released to appear for examination.

A press dispatch from Lansing, Mich., reports that the Minneapolis, St. Paul & Sault Ste. Marie road, which refused to allow the inspection of immigrants' baggage at the Eastern terminus of its road, has been sustained in its refusal by the Supreme Court of Michigan. The State Board of Health had ordered the inspection and entered suit to compel compliance by the road.

Governor Brown, of Kentucky, in his annual message presented to the legislature this week, asked for the passage of a law empowering the railroad commissioners of the state to adjust freight and passenger rates. Referring to the proposed absorption of the Chesapeake, Ohio & Southwestern by the Louisville & Nashville, the Governor announced that "he will fight it to the last ditch."

Two bills to regulate railroad receiverships are before the House Judiciary Committee at Washington. One is by Representative Latimer, of South Carolina, who wishes to enact a law which will allow the state to sue and collect about $200,000 taxes from the Richmond & Danville. Another bill limits the time which a road shall be in the hands of a Receiver to three years, at which time, if there is no settlement, it must be sold.

Superintendent Donnelly, of the Lehigh Valley road, stated to a reporter Dec. 28 that the number of men who went on strike between Mauch Chunk and Jersey City was 978, and that of these 756 had been re-employed. Of the 144 striking engineers 91 are back. Out of 178 firemen 108 are back. Nearly all the conductors and switchmen have been re-employed. On Saturday last it was announced at Easton that no more of the old employees would be re-employed. An officer of the road said it was only a temporary order, but so long as there were assaults and intimidation by strikers, the probabilities were that the order would continue in force.

Poldi Steel.

Every mechanic knows the advantage and economy in buying and using good steel for his tools, and the great advances in the manufacture of steel and iron during the past 10 years, especially in fine tool steel, make it possible for miners, mechanics and even professional men, such as physicians and dentists, to secure tools and instruments that are all that could possibly be asked. Among the special products lately introduced into the market of this country is the Poldi crucible cast steel manufactured by the Poldi Steel Works, Ltd., of Kladno, Bohemia, and handled by the Frasse Company, of New York City. The manufacturers furnish five special brands of this steel used by railroads: "No. 0 silver," a special steel for working the hardest materials, such as chilled iron, rolls, locomotive tires, safe plates and brakeshoes; "No. 1 white," an extra hard steel for turning, planing and slotting tools for heavy work, also for razors, drawing knives, saw files and carving tools; "No. 2 yellow," a very hard product for drills and chisels on hard materials and for turning tools, mill picks and other tools for cutting hard rock, and "No. 3 dark yellow," a hard steel for mill picks and mill tools, stone hammers, dies, twist drills and bits, cold chisels, pivots and bearings.

No. 00 gold label, a special self-hardening steel, distinguished from other steel by its unusual high temper, which it does not lose in a dark heat. It has a very dense structure and fine grain easily malleable at a bright cherry heat. This steel is specially made for turning tools for the hardest materials, for shafts and bearings, polishing rolls and plates and parts of machines subject to wear or high pressure.

The working of Poldi steel for manufacturing tools is the same as that of all good cast steel and the tempering is done in the usual manner. Every ingot before being worked under a roll or hammer has been reduced under a hydraulic press of 660 tons. The steel is hardened by simply cooling it in the air and after heating must be covered with sand or ashes to prevent its getting hard, if a mild steel is desired. The "No. 0" is not simply a high carbon steel, but is a co-mixture of other metals added to the iron in process of making which produces a steel susceptible of the highest degree of temper, but, unlike self-hardening steels, it does not have a crumbling edge when subjected to pressure. The above number of different grades of steel are carried which are suited to the different purposes explained. Lathe and planing tools in all sizes and dimensions of flat are kept. The Frasse company will submit samples for trial to manufacturers, and they keep in stock sets of 16 tools of dimensions varying from ⅜ × ¾ in. to ½ × 1 in., and are prepared to furnish at short notice such tools in sets of ⅝ × 1¼ in. to 1 × 2 in. made of either No. 0 or No. 3.

The Medals of the Franklin Institute.

We have received from the Franklin Institute a circular asking attention to the medals at the disposal of the Institute, and asking our help in bringing the objects of these awards before the public. We had supposed that the existence and purposes of these medals were well known, but perhaps it is well to tell the younger generation something of them. The Elliott Cresson medal was founded in 1848 by the gift of the late Elliott Cresson. It is granted for some discovery in the arts and sciences, or for the invention or improvement of some useful machine, or for some new process or combination of materials in manufactures, or for ingenuity, skill or perfection in workmanship. This is a gold medal. The John Scott Legacy provides for a premium and medal—$20 cash and a medal of bronze—awarded by the city of Philadelphia. This was founded in 1816 by John Scott, a merchant of Edinburgh, who bequeated to the city of Philadelphia a sum of money the interest of which should be devoted to rewarding ingenious men and women who make useful inventions. Still another medal is at the disposal of the Institute; that is the Edward Langstreth medal of merit, founded in 1889 by Edward Langstreth, machinist, and formerly in the Baldwin Locomotive Works. This is a silver medal awarded for useful invention, important discovery and meritorious work. Particulars as to the manner of application for the investigation of inventions and discoveries, with a view to competing for these medals, may be had by addressing Dr. William H. Wahl, Secretary Franklin Institute, Philadelphia, Pa.

Forty Passengers Killed in India.

The details of a terrible railroad accident at Karaidai, near Coimbatore, on the Madras Railway, on the 9th of November, which have now been received, show that it was caused by a sudden flood of the river Periyapolliem, which washed the ballast from under the rails for a distance of 160 ft. The train left the rails and came to a standstill in the permanent way, but the carriages telescoped badly, the passengers being literally crushed to pieces. There were no first and second class passengers in the train, though a few had left it just previously. The dead are now ascertained to be 39, and the wounded 45, but several of the latter are not expected to recover. This is the most shocking among the very few disasters involving serious loss of life that have occurred on the Madras Railway.—*Indian Engineering.*

The Reorganization of the Erie.

It is to be feared from the reports which have been current lately that the scheme for the reorganization of the New York, Lake Erie & Western Railway Company will be marked by some very unpleasant characteristics. That the second mortgage bondholders should have to submit to some sacrifice is natural enough, for their lien is comparatively weak, and they practically rank just before the preferred shareholders; but still it would be most unjust to cut down the rate of interest on the seconds from 6 per cent. to 4 per cent., whilst at the same time imparing the value of the mortgage by increasing its amount. Moreover, it is said that no assessment is to be made on the shares. In other words, the bonds, which are held almost entirely in this country, are to be taxed for the benefit of the holders of the floating debt, who are, or should be, unsecured creditors, whilst the shares, which are, we need scarcely say, held to a large extent in the United States, are to be allowed to get off scot free. In other cases, we know, a similar policy has been followed, but no one can contend that it was in the slightest degree justifiable.—*The Economist* (*London*).

A Reunion of Arlberg Tunnel Builders.

When the great Arlberg tunnel was completed it was proposed to have, at the spot where the headings meet, a decennial reunion of those who participated in the work. This reunion was held a few weeks ago with appropriate ceremonies. Director von Poschacher delivered a brief address in the tunnel itself, outlining its history and detailing some of the experiences gone through in its construction. A dinner and a torchlight parade at St. Anton followed later in the day.

Ohio River Improvement.

A project for increasing the navigable depth of the upper Ohio River by artificial means was the subject of a lecture by Col. T. P. Roberts before the Western Pennsylvania Engineers' Society in Pittsburgh recently. He explained that navigation between the mouth of the Great Kanawha and Pittsburgh, a distance of 263 miles, was dependent in the case of the coal fleet upon the rainfall, except in the spring season. During the autumn and winter coalboats which draw eight and ten feet of water are tied up at Pittsburgh for months. When the size of the coal fleet is considered, this state of affairs is very serious. In 1889 there were in Pittsburgh 125 towing steamers and 3,891 coalboats with a capacity of 2,253,500 tons. Several adjustable dams are building below Pittsburgh for the purpose of securing higher water, but in order to extend navigation to the Kanawha about thirty dams would be needed, the cost of which would be in excess of $20,000,000, and the early construction of such a system of dams is dubious in the extreme. In place of them he proposes to assist "at critical times and for brief periods the coalboat navigation of the upper Ohio River by supplying volumes of water from storage dams or reservoirs constructed and maintained solely for that purpose." He calculates that a reserve storage of about 2,000,000,000 cu. ft. would maintain for two days a depth of 8 ft. on the 5-ft. natural channel depth of the upper Ohio; or would convert 8 ft. of natural depth to 10 ft. He recom-

mends a series of dams with flood gates constructed on the Youghiogheny, Kiskiminetas, Mahoning, Clarion and Red Bank and other creeks. Here great bodies of flood water could be stored for use in emergencies. In connection with such a system of dams it would be advisable to provide on their side tributaries and headwaters a system of secondary reservoirs to refill the primary dams at any convenient time after the latter had been emptied.

New Docks at Buffalo.

A company has been organized to increase the dock facilities of Buffalo, and to that end it has contracted to purchase Squaw Island, a piece of land in the Niagara River, about one mile long, comprising 137 acres. The purchase price is said to be $1,000,000. It is proposed to develop about 25,000 ft. of dockage on this island, with a capital of about $5,000,000. Surveys, soundings and borings are being made. Arrangements are said to have been made for connections with the tracks of the Erie and New York Central railroads. The island is sheltered from southwest winds and is very suitable for the purposes designed. The project is being pushed by Mr. D. M. Thomas, 80 Broadway, New York, and Mr. James H. Mayo.

Lectures at Cornell.

Cornell University announces the following non-resident lectures at the College of Civil Engineering: Feb. 2, Mr. Clemens Herschel, on the "Construction of Roman Water Works"; April 20, Prof. T. C. Mendenhall, on the "Pendulum Investigations upon the Form of the Earth"; May 4, Mr. M. R. Freeman, on "Experiments upon the Flow of Water in Large Mains"; May 11, Mr. A. P. Boller, on "New Phases of Bridge Construction"; May 18, Mr. Frank Washburn, on "High Masonry Dams."

CAR BUILDING.

The Chesapeake & Ohio Railroad is expected to be in the market within the next month as a large buyer of cattle, refrigerator and grain cars.

The Ensign Mfg. Co., of Huntington, W. Va., expects to resume nearly in full force before February and will have a large portion of the plant at work by Jan. 15. The company finds that the demand for new cars is confined almost exclusively to special kinds. The Ensign works depend almost entirely now upon the Canda patent cattle and refrigerator cars for its trade.

BRIDGE BUILDING.

Bellefontaine, Mo.—The superstructure of the Missouri River bridge at this point is now practically completed and engines have been run across the structure. It is stated that the road will be formally opened for railroad traffic early in February. This bridge is being built by the Chicago, Burlington & Quincy and was described in the *Railroad Gazette* of Dec. 15.

Brockville, Ont.—The plans for the proposed new international bridge across the St. Lawrence River are now being prepared by Engineer Smellie. C. J. Pusey, the chief promoter of the scheme, has taken up his residence at Brockville.

Columbus, O.—The first step toward the erection of the St. Clair avenue viaduct over about twenty railroad tracks has been taken, and bids have been asked up to Feb. 9. The bridge will be an eight-span plate girder, with 30 ft. roadway. There are to be two sidewalks, each 8 ft. wide. The masonry will require 2,030 ft. of sandstone.

Dunwich, Ont.—Tenders are called for by A. A. McKillop for building a Queen truss bridge over Brooks Creek, on Talbot Road, in the township of Dunwich. Plans and specifications may be seen at the office of A. W. Campbell, C. E., St. Thomas.

Easton, Pa.—The new Board of County Commissioners on Jan. 1 rescinded the action of the retiring Board in awarding to the Lehigh Valley Construction Co. on Dec. 29, the contract to widen and rebuild the bridge over Bushkill Creek at Third street at its bid of $26,393, and decided to readvertise for proposals, to be filed by Jan. 12.

El Paso, Tex.—The Southern Pacific is building a new bridge about 1,200 ft. long across the Rio Grande at El Paso, to replace the present wooden bridge at that site. The foundation work is now being carried on.

Hamilton County, O.—The county commissioners will meet with the commissioners of Clermont County on Jan. 19 to let the contract for the new Milford bridge.

Philadelphia.—A bill has been introduced in the City Council to authorize the erection of a double-decked bridge over the Schuylkill River at Gray's Ferry. The Department of Public Works has had plans prepared for a bridge at this point to cost $300,000. The city expects to contribute only part of this amount, the balance being paid by the Pennsylvania and Philadelphia & Reading railroads; but these companies have not yet signified what proportion of the cost they are willing to bear.

Red Deer, Alberta.—The contract for constructing a traffic bridge across the Red Deer River has been awarded to Mr. D. W. McKenzie, of this place.

Scranton, Pa.—The ordinance providing for the bonding of the city in the sum of $250,000 for the erection of the Roaring Brook and Linden street bridges has passed through the Council and been sent to the Mayor. Three plans are being considered for the Linden street bridge.

West Chester, Pa.—The County Commissioners are considering the construction of an iron bridge over White Clay Creek near Laudenberg.

Wheeling, W. Va.—The County Commissioners of Ohio County, of which Wheeling is the county seat, last week accepted from the Wrought Iron Bridge Company, of Canton, O., a new bridge erected by that company over Wheeling Creek at Rooney's Point. The bridge is a single span, and cost $4,000 without the abutments.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In Massachusetts it is laid down by the Supreme Court that where a vendor of goods delivers them to a railroad to be carried to the purchaser, though the title to them may pass to the purchaser, by such delivery and the nature and address of the consignee, who is the purchaser, may be known to the company, the vendor is presumed to make the contract for transportation on his own behalf, and is liable for the freight; but such presumption may be rebutted by evidence showing that it was understood that the consignee should pay the freight.[1]

In New York certain hay dealers, in accordance with a rule of defendant railroad company, were accustomed to unload their hay into defendant's freighthouse, and then to load it on the cars. Though frequently requested, defendant failed to furnish cars sufficient to transport the hay as fast as delivered, and it accumulated until the freighthouse was full. The agent of the dealers thereupon notified persons supplying them with hay not to deliver any more, but defendant's agent told them he would find room for it, and had the hay subsequently delivered placed in an open shed. Defendant had general orders to ship the hay as fast as it could be loaded on the cars. The Supreme Court holds that nothing further being required to prepare the hay for transportation, and no further orders being necessary to enable defendant to forward it, defendant's liability, therefore, as soon as delivered at the freighthouse, was that of a common carrier, and not of a warehouseman.[2]

In Alabama the Supreme Court rules that where there is unreasonable delay on the part of a carrier in transporting livestock, and the stock, when delivered, is found to be in an unsound condition, the burden is on the carrier to show that such unsound condition is not due to the unreasonable delay.[3]

In the Federal Supreme Court it is held that in an action by a shipper to recover damages under a statute forbidding discrimination in freight rates, the railroad company cannot set up in justification of the lower rate a contract, with the party in whose favor they were made, whereby, in consideration of the lower rates, such party releases the railroad company from an unexplained, indefinite and unadjusted claim for damages arising from a tort; for to allow such a defense would practically emasculate the law.[4]

The Court of Appeals of Texas rules that a landowner who can protect his crops, at a moderate cost, by repairing his fence can recover from a railroad company, for depredations by stock entering his premises through an opening left by the railroad company, only an amount sufficient to make the repairs.[5]

In Alabama the Supreme Court rules that a railroad is guilty of negligence where its trains are run in the night-time at such rate of speed that, by reason of the darkness of night, without any intervening unusual natural causes, such as fog or falling rain or snow, stock cannot be seen, by the aid of the headlight, in time to prevent injury by the use of the ordinary means and appliances with which trains are usually supplied.[6]

In Mississippi in an action for the killing of a bull which was attracted to the roadbed of defendant's railroad by salt which defendant had put on its tracks, it was error, says the Supreme Court, to charge that a railroad company is *prima-facie* responsible when, by any act of its own, animals are invited on its roadbed and are killed, where it was shown that defendant used the salt as a solvent to free its tracks and switches of snow and ice in order to facilitate the handling of its trains, and that salt was the ordinary and usual solvent for such purpose.[7]

In Iowa the Supreme Court holds that in an action against a railroad for damages caused by an overflow, the fact that defendant acquired the railroad after the embankment was constructed, and that it was not served with express notice of the nuisance and demand for its abatement, was no defense to the action, where defendant's officers were fully informed of the injury, as they had no right to presume that this damage had been paid for in the original procurement of the right of way.[8]

The Supreme Court of New York rules that an open bridge, made with stringers and cross-timbers, 7 in. wide and 6 in. apart, is not a sufficient cattle guard, within a statute providing that railroad companies shall maintain cattle guards at all road crossings sufficient to prevent horses from going on its tracks.[9]

The Supreme Court of Michigan holds that a railroad is not guilty of negligence in not erecting a screen or fence at its station between the driveway thereto and the tracks, so that horses standing at the station may not be frightened at approaching trains. In this case it is ruled that where a young horse, standing at a railroad station at which it had never been before, became restless at the sound of an approaching train before it had come in sight, and those in charge of it, instead of driving away, as they might safely have done, attempted to hold it by the head, and plaintiff, who was in the wagon, remained there, instead of alighting, the action of plaintiff as well as those in charge of the team was negligence.[10]

Injuries to Passengers, Employees and Strangers.

In Lousiana the plaintiff alleged that his son was ejected from defendant's train, at night, in freezing weather, at a certain station, and had to wait several hours before he was able to return to the place from which he started; that by reason of such ejectment and exposure he contracted a cold from which he died. Several physicians testified that deceased died of typhoid fever; that the same was a germ disease; and that deceased's alleged exposure could not have brought on the same, unless the germ of the disease was in his system before he started on his journey. The Supreme Court holds that deceased's death was not the result of the ejectment, and hence formed no basis for damages.[11]

In Kentucky it is laid down that it is not contributory negligence, as matter of law, for a person to attempt to board a slowly moving electric car.[12]

In the same state it is held that where the rules of a railroad company require passengers of the combined freight and passenger train to get on and off wherever it is convenient for the train to stop, it is not negligence for a passenger to board the train while it is standing 40 or 50 ft. from the station platform.[13]

In Texas the Supreme Court holds that where two connecting railroads are operated as one continuous line, under one management, with the same employees, and are, so far as the public can observe, one line, and use coupon passenger tickets which compel a continuous passage from stations on one road to stations on the other, both are liable in damages to a passenger who purchases such a ticket, and is wrongfully compelled to alight from the train at a point distant from the station to which he has paid his passage.[14]

In Indiana the Supreme Court rules that a person who gets on the platform of an express car without having purchased a ticket, and remains thereon, in violation of the company's rules, for the purpose of being carried from one station to another, is not a passenger. The fact that a brakeman of such train, on discovering such person, accepts from the latter the required fare from the station where he got on to his place of destination, does not constitute such person a passenger, since the former cannot waive the rules of the company.[15]

In Indiana it appeared that the road was constructed on the "half-tie" system, which is the usual mode of construction in Indiana, and that the train in question was distributing the balance of the ties necessary to be put in before ballasting the road. While the train loaded with ties was running 15 or 20 miles an hour, the car on which plaintiff (an employe) was riding was derailed, causing the injuries complained of. The road had been inspected at the place of the accident a few hours before, and it was thought to be as safe for construction trains as any other part. The road had not been opened for business when the accident happened. The Supreme Court holds that plaintiff assumed the risk, and could not recover, the unfinished condition of the road being obvious.[16]

In Pennsylvania, in an action by a widow against a railroad company for negligently causing the death of her husband, a car inspector of a connecting road, it appeared that defendant's "drill crew" placed on a siding of deceased's road, designated by its Yard Master, cars from defendant's road for transportation over the former's line; that deceased began inspecting such cars; that such crew delivered the waybills to such Yard Master, boarded their engine, and started to return to their own road; that, finding such train did not clear the switch, the crew, with their engine, pushed the train further from the switch, in doing which they killed deceased. The Supreme Court rules that such crew were not in the employ of the connecting road, and deceased's co-employes, at the time of the injury, but were defendant's servants.[17]

In West Virginia it is ruled that where a brakeman knows the danger arising from a limb of a tree projecting over the track, which limb, though dangerous, can be avoided by ordinary care, if he continues in the employment after such knowledge, without protest or promise that the limb will be shortly removed, he will be held to have assumed the risks.[18]

In Georgia the Supreme Court holds that where plaintiff, while in a proper place at a crossing, was injured by a stick of wood which either fell or was thrown from a passing locomotive, the necessary inference, in the absence of any evidence to the contrary, is that the negligence was chargeable to the company's servants while acting in the scope of their duties.[19]

In Texas the Supreme Court holds that where a brakeman was injured by a "hand hold" pulling out of a rotten car roof, the fact that he knew that the tops of some of the cars were rotten does not charge him with knowledge that they were rotten where the "hand holds" were attached, in the absence of evidence that the cars were so uniformly rotten as to establish a condition which he was bound to notice.[20]

In Alabama it is ruled by the Supreme Court that where the rules of a railroad require an engineer to slacken speed before reaching a switch, and also make it the duty of the conductor to signal the engineer for that purpose, so as to ascertain if the switch was properly set, and the conductor failed to perform his duty, or to see that the signal was given by a switchman, and an injury resulted to the conductor from such negligence, he was guilty of contributory negligence.[21]

In Kansas in an action by a section hand for personal injuries resulting from the negligence of a co-employe, it appeared that plaintiff was unloading ties; that as he took hold of one end of a tie, his co-employe carelessly turned it over so as to strike plaintiff, causing the injury. The Supreme Court decides that the evidence was sufficient to support a verdict for plaintiff.[22]

In Arkansas plaintiff, an employe of defendant railroad company and experienced in his business, while standing on a rail to steady it for a co-employe, who was cutting it with a chisel, was struck in the eye by a splinter from the rail or chisel. It appeared that the chisel was a proper instrument for the work for which it was used, of good material, and, though somewhat battered from use, its condition was visible and might have been known to plaintiff, who handled it every day in the course of his duties, if he had used ordinary care. The Supreme Court holds this to show no cause of action, in that plaintiff must be considered to have assumed the risks incident to its use.[23]

In Texas it is laid down that a master mechanic in charge of a roundhouse of a railroad company, with power to employ or discharge hands, is a vice-principal, and notice to him of defects in the roundhouse is notice to the company.[24]

In the Federal Court it is held that where the conductor of a freight train had ordered plaintiff to open a switch, and cut off a flat car from the train and place it on a side track, he had a right to presume that his orders had been obeyed, and that plaintiff was in a position to uncouple the cars safely; and hence his subsequent order to the engineer to "ease up on the pin" by a forward motion of the engine, so that the car might be uncoupled, was not negligence, though such forward motion was what injured plaintiff.[25]

In Illinois it is ruled that in an action to recover for death caused by a boiler explosion, evidence that the engine was regarded by defendant's servants as dangerous is admissible, as tending to show defendant's notice of its defective condition.[26]

In Indiana it appeared that plaintiff, when approaching the crossing, waited for a freight train to pass, and, after looking, and neither seeing nor hearing any train, he started up the grade to the crossing, and when on top of the grade saw a passenger train approaching at the rate of 40 miles an hour; that no signals were given; that plaintiff's horse was entering on the track, but, on account of the roughness of the crossing, plaintiff thought he could more safely go forward than attempt to back out, and so whipped up his horse, and the rear of the wagon was struck by a car. Defendant's Civil Engineer and others testified that from the slope of the grade a train was visible 1,405 ft., but plaintiff testified to the presence of trees, which obstructed the view of a train until it came around a bend 700 ft. distant. The Court of Appeals holds that a finding of the jury that plaintiff was not guilty of contributory negligence would not be disturbed.[27]

In Vermont it appeared that the accident occurred at a point where a highway crossed several of defendant's tracks, and that the intestate, driving a loaded wagon, had crossed one track just after a freight train had passed, and while attempting to cross the next track, 23 ft. distant, in full view of a passenger train moving towards him, was struck by this train and killed. Plaintiff's evidence tended to show that defendant's flagman had signaled the intestate on approaching the first track to cross, and that, after he had passed this track, a brakeman on the freight train, seeing his danger, shouted to the engineer of the passenger train to stop, and that both engines were ringing their bells and blowing their whistles, thus causing a great deal of

noise and confusion. The Supreme Court holds the railroad liable.[28]

In Minnesota the evidence was that plaintiff, a boy 11 years old, was sent by his parents on an errand which obliged him to cross defendant's tracks at a certain street; that he found the crossing obstructed by defendant's freight train, but, seeing the engineer looking at him, undertook to climb over the bumpers between two freight cars, as was the custom when the crossing was so obstructed; that, while one foot was on the connecting link, the train was suddenly and negligently backed and the foot crushed. The Supreme Court holds that the evidence justified a verdict for plaintiff.[29]

[1] Union Freight R. Co. v. Winkley, 34 N. E. Rep., 91.
[2] L. & L. F. Ins. Co. v. R. W. & O., 23 N. Y. S., 231.
[3] R. & D. vs. Trousdale, 13 South. Rep., 23.
[4] U. P. v. Goodridge, 13 S. Ct., 976.
[5] Gf. C. & S. F. v. Simonton, 22 S.W. Rep., 285.
[6] Cent. R. & B. Co. v. Ingram, 12 South. Rep., 801.
[7] L. N. O. & T. v. Phillips, 12 South. Rep., 825.
[8] Willitts v. C., B. & K. C. Ry., 55 N. W. Rep., 313.
[9] Ham v. N., D. & C., 23 N. Y. S., 197.
[10] Flagg v. Ch., D. & C. G. T. J., 55 N. W. Rep., 444.
[11] Randall v. N. O. & N. E., 13 South. Rep., 166.
[12] C. P. Ry. Co. v. Rose, (Ky.) 22 S. W. Rep., 745.
[13] L. & N. v. Long, 22 S. W. Rep., 747.
[14] Howe v. Gibson, 22 S. W. Rep., 826.
[15] C. & E. v. Field, 34 N. E. Rep., 4:6.
[16] E. & R. v. Henderson, 23 N. E. Rep., 1,021.
[17] Vannatta v. Cen. R. Co., 26 An. Ry., 384.
[18] Wooddell v. West Virginia Imp. Co., 17 S. E. Rep., 386.
[19] S., F. & W. Ry. Co. v. Slater, 17 S. E. Rep., 350.
[20] Fordyce v. Culver, 22 S. W. Rep. 237.
[21] L. & N. R. Co. v. Mothershed (Ala.), 12 South Rep., 714.
[22] Atchison, T. & S. F. v. Brassfield, 32 Pac. Rep., 814.
[23] Fordyce v. Stafford, 22 S. W. Rep., 161
[24] Missouri Pac. v. Sasse, 22 S. W. Rep., 187.
[25] Hudson v. C., C. & C. 55 Fed. Rep., 248.
[26] T., St. L. & K. C. v. Bailey, 33 N. E. Rep., 1089.
[27] L., E. & St. L. v. Kelly, 33 N. E. Rep., 1103.
[28] Geromd v. Vt. R. Co., 26 Atl. Rep., 401.
[29] Henderson v. St. Paul & D. Ry., 55 N. W. Rep., 53.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Burlington, Cedar Rapids & Northern, semi-annual, 1½ per cent., payable Feb. 1.

Canadian Pacific, semi-annual, 2½ per cent., payable Feb. 17.

Chicago Junction Railways & Union Stock Yards Co., semi-annual, 3 per cent. on the preferred stock and 4 per cent. on the common stock, payable Jan. 24.

Concord & Montreal, 1¼ per cent., payable Feb. 1.

Delaware, Lackawanna & Western, quarterly, 1¾ per cent., payable Jan 21.

Holyoke & Westfield, annual, 5 per cent.

Terre Haute & Indianapolis, semi-annual, 3 per cent., payable Feb. 1.

Vandalia, semi-annual, 3 per cent., payable Feb. 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Traveling Passenger Agents' Association* will hold its convention in New Orleans, La., Jan. 9.

The Central Railway Club will meet at the Hotel Iroquois, Buffalo, N. Y., Jan. 24.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each alternate month, commencing January.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of St. Louis.

At the meeting held on Jan. 3 at, Washington University, "Street Railways" was the topic for discussion. Mr. Winthrop Bartlett presented some facts and figures regarding the cable and electric railways of St. Louis.

New England Railroad Club.

The regular meeting of the club will be held at Wesleyan Hall, 36 Bromfield street, Boston, Wednesday, Jan. 10, at 7.30 p. m. The subject for discussion, "Railroad Building with Reference to Economy in Operating," will be opened by C. Frank Allen, of the Massachusetts Institute of Technology.

American Society of Civil Engineers.

The annual meeting will be held on Wednesday, Jan. 17, beginning at 10 a. m. The annual report of the Board of Direction and reports from special committees will be presented. The amendment to the Constitution given in the last *Bulletin* will be considered, and the ballot for officers of the society for the ensuing year will be canvassed. Arrangements for the entertainment of the members on Thursday are in progress.

Engineers' Society of Western Pennsylvania.

The regular meeting of the society was held on Dec, 19, Mr. M. J. Becker, President, in the chair. The following nominations were reported: For President, Charles Davis; for Vice-President, W. G. Wilkins; for Direction, Julian Kennedy and Thos. P. Roberts; for Secretary, Daniel Carhart, Professor of Mathematics, Western University of Pennsylvania; for Treasurer, A. E. Frost, Professor of Physics, Western University of Pennsylvania.

Mr. Thos. P. Roberts read a paper on "A proposed method of increasing, at critical times the navigable depth of the upper Ohio River by artificial means," which is referred to in another column.

The paper covered by diagrams the low and high water stages of the Ohio River for the past 20 years, the amount of coal carried by barges down the river, and the possibility of holding in reservoirs all possible waters to increase the flow of the river at low stages. The paper was fully discussed by the President, and Messrs. W. L. Scaife, G. Kaufman, T. H. Johnson and W. G. Wilkins.

Mathematical Society.

The New York Mathematical Society held its annual meeting recently in Hamilton Hall, Columbia College. Prof. Henry B. Fine, of Princeton, the vice-president, presided. Prof. Lemen Newcomb, of Johns Hopkins University, and Director of the United States Naval Observatory, delivered an address entitled "Modern Mathematical Thought." The following officers were elected for the ensuing year: President, Dr. Emery McClintock, of the Mutual Life Insurance Company; Vice-President, Dr. G. W. Hill, late of the United States Nautical Almanac; Secretary, Dr. Thomas Scott Fiske, of Columbia College; Treasurer, Harold Jacoby, Columbia College; Librarian, Gustav Legraves, College of the city of New York; Members of the Council, Prof. E. H. Moore, University of Chicago; Prof. Simon Newcomb, of Washington; Prof. R. S. Woodward, of Columbia College; Prof. Henry B. Fine, of Princeton, and Prof. Mansfield Merriman, of Lehigh University; Publication Committee, Dr. Thomas S. Fiske, of Columbia College and Prof. Alexander Ziwet, of the University of Michigan.

Boston Society of Civil Engineers.

A regular meeting of the Society was held at its rooms, 36 Bromfield street, Boston, on Wednesday, Dec. 20, 1893.

Messrs. John C. Chace, of Wilmington, N. C., and Robert S. Hale, of Boston, were elected members of the Society.

A memoir of the late Richard Forbes, of Worcester, a member of the Society, was presented by Messrs. L. A. Taylor and C. A. Allen, a committee of the Society.

Mr. Henry Manley exhibited specimens of the *Teredo navalis*, which were found in the planking of a scow that had been at work in the Boston Harbor the past summer, and gave a short account of the habits of this animal.

Mr. Arthur W. Hunking read the second part of his paper presented at the last meeting, entitled "Notes on Water Power Equipment and Considerations Affecting the Selection of a Turbine." In the discussion which followed Messrs. Frizzell, Hale and Freeman took part.

The discussion of the evening on the organization of a City Engineer's Office was then taken up, and in the absence of the author the Secretary read a paper prepared by Mr. Albert F. Noyes. The discussion was continued by Messrs. Kimball, McClintock, Swan and others. At the next meeting, on Jan. 24, the same subject will be further considered, and papers will be presented on the best methods of carrying on the work of a city engineer's office.

PERSONAL.

—Mr. E. W. Hadley, Receiver of the Oregon Pacific, has resigned.

—Mr. Frank G. Kretschmer, Special Agent of the Interstate Commerce Commission, died at Thomasville, Ga., Dec. 23, of consumption.

—Capt. James Henry has been appointed Manager of the Lehigh Valley Transportation Company's lake lines, vice Mr. John Gordon, resigned.

—Mr. J. K. Bole has resigned his position as one of the Managers of the Otis Steel Co., of Cleveland, to devote his time to other interests. Mr. Bole is one of the Receivers of the Valley Railroad of Ohio.

—Mr. Edward C. Lynde, Assistant Secretary of the Lackawanna Iron & Steel Co., of Scranton, Pa., died in that city Dec. 30, aged 62 years. He was secretary of the above named company since December, 1859.

—Mr. A. B. Cutts has been appointed successor of Mr. C. M. Pratt as General Passenger and Ticket Agent of the Minneapolis & St. Louis road, Mr. Pratt resigning to act as Emigrant Agent of the Western Passenger Association at New York.

—Mr. J. D. Riddell has been appointed Assistant General Freight Agent of the Kansas City, Fort Scott & Memphis, with office at Birmingham, Ala. Mr. Riddell is now connected with the general freight office at Kansas City. He succeeds Mr. C. W. Cheers, resigned.

—Mr. John Gordon, who has been joint General Manager of the Northern Steamship Company and the Lehigh Valley Transportation Company, has resigned as General Manager of the Lehigh Valley line and will give his entire attention to the Great Northern line.

—Mr. C. A. Merriam, formerly General Superintendent of the San Antonio & Aransas Pass road and later of the Monterey & Mexican Gulf Railroad, has accepted a position in charge of the extensive new works of the Charleston Mining & Manufacturing Co., at Charleston, S. C.

—Mr. Worthington C. Smith, of St. Albans, Vt., a former Trustee and Manager of the Vermont Central and Vermont & Canada railroads, died on Jan. 2 of paralysis. He was born in St. Albans in 1823, and was a brother of the late ex-Gov. J Gregory Smith, for many years President of the Central Vermont.

—General John W. Sprague, a former officer of the Northern Pacific, died on Dec. 24 at Tacoma, Wash., where he had lived for many years. He was President of the Board of Trade and of various banks and companies in that town. He was in charge of the Western Division of the Northern Pacific for 13 years, resigning in 1883.

—Mr. E. B. Wall, who has had the title of Assistant to the President of the Pennsylvania lines, since last March, has been transferred from Chicago to Pittsburgh, his title being Assistant to the General Manager. He will have general oversight of the purchasing department. Mr. Wall is at present in Europe, but is expected to return in a few weeks.

—Maj. A. Pope, Secretary of the Southern Railway & Steamship Association, has resigned, and Mr. W. L. McGill has succeeded him. Major Pope was General Freight Agent of the Norfolk & Western for some years up to 1892, when he became secretary of the association. Mr. McGill, who succeeds him as Secretary, has been clerk to Major Stahlman, the Commissioner.

—Dr. Franz Grashof, professor of applied mechanics and machine design at the Technical High-Shool at Carlsruhe, Germany, died recently after a prolonged illness. Dr. Grashof's high rank as an engineer and as a teacher of engineering is well known to all members of the profession. Since 1856 he was prominently identified with the Society of German Engineers, and to him that organization owes much of its prosperity and influential standing. He was also an honorary member of the American Society of Mechanical Engineers.

—Mr. Addison Day, well known as a railroad man in New England and New York for 40 years, died at his home in Rome, N. Y., Dec. 25, at the age of 70. Mr. Day began his railroad career as clerk for Henry Gray, Superintendent of the Western Railroad of Massachusetts. He was afterward Division Superintendent of the Chicago & Rock Island, and was Superintendent of the Rome, Watertown & Ogdensburg for 12 years. Subsequently he was on the New York & Oswego Midland and the St. Louis, Iron Mountain & Southern.

—Mr. Chauncey Andrews, one of the pioneer iron and coal operators in the Mahoning Valley in Ohio, died at Youngstown, O., on Dec. 25, aged 70 years. Mr. Andrews, in developing the coal mines of the Mahoning Valley, engaged in railroad construction and built several important lines. He projected and was largely interested in the following railroads: Niles & New Lisbon, now part of the Erie system, the Mahoning Coal Railroad, the Pittsburgh & Lake Erie road, the Montour Railroad and the Pittsburgh, Youngstown & Chicago road.

—Mr. William H. Taft has been appointed Acting Superintendent of Motive Power of the Boston & Albany, to succeed Mr. A. B. Underhill, resigned. The office is to be transferred from Springfield, Mass., to Boston, where Mr. Taft has been Division Master Mechanic since October, 1886. Mr. Taft began as fireman for the Boston & Albany Railroad in 1862, and was made an engineer in 1864. In May, 1879, he was appointed foreman of the machine shop at Worcester by Mr. Underhill, and remained there until appointed Division Master Mechanic.

—Mr. T. H. Fennell, General Superintendent of the Northern Division of the Lehigh Valley Railroad, has resigned that position, which he has held since the opening of the Buffalo extension of the railroad. It is said that with Mr. Fennell's retirement the General Superintendency of this division will be abolished and the line divided into three divisions, the first extending from Buffalo to Manchester, the second from Manchester to Sayre, Pa., and the third from Sayre to Coxton. Mr. Charles A. Beach, Assistant Superintendent of the Western Division of the New York Central road, will be in charge of the Buffalo Division. The appointment of superintendents for the other two divisions has not yet been announced.

—Major James M. Edwards, Third Vice-President of the Yazoo & Mississippi Valley road, has resigned that office to accept a position with R. T. Wilson & Co., New York bankers, who have been largely interested in this property for many years. Mr. Edwards began railroad work in 1870, and has been engineer and superintendent of a number of Southern roads. In 1882 he became connected with the Louisville, New Orleans & Texas, and had charge of the construction of the 450 miles of that line from Memphis to New Orleans, which were built between 1882 and 1884. He continued as Vice-President and General Manager of that road until it was purchased by the Illinois Central in 1892. Since then he has been Vice-President of the Yazoo & Mississippi Valley, which was organized as its successor.

—Johann Bauschinger, for many years professor of mechanics and graphical statics at the Technical High-School at Munich, Germany, died on Nov. 25, at the age of 59 years. To engineers all over the world Professor Bauschinger's name is a familiar one, being coupled specially with much interesting and valuable experimental work on the strength and other physical characteristics of structural materials, and engineering textbooks abound with references to the results of his investigations in this field. One of the conditions of Bauschinger's acceptance of the professorship at Munich, in 1868, was the installation of a testing laboratory, and from a small beginning this establishment, under his supervision, grew into one of the most thoroughly equipped of its kind. In 1871 Professor Bauschinger published his work on "Graphical Statics." By far the most important of his literary work is found in his "Communications from the Mechanical Laboratory of the Royal Polytechnic School at Munich," in which the results of his painstaking investigations into the resistance of materials were given to the public. Originally, these communications appeared serially in the *Zeitschrift* of the Bavarian Engineers' and Architects' Society, but gradually they assumed proportions much greater than had been expected at the outset, and it was deemed expedient to issue them, later on, in separate pamplet form. Twenty-one of these pamphlets, each complete in itself, had been brought out up to the time of his death. The

twenty-second, in which the behavior of wrought iron under repeated stress was taken up, remains unfinished. Besides belonging to a great many prominent foreign engineering societies, Professor Bauschinger was one of the distinguished honorary members of the American Society of Mechanical Engineers.

ELECTIONS AND APPOINTMENTS.

Addison & Pennsylvania.—Albert Howe has been appointed Acting Treasurer, with office at 49 Broadway, New York City, vice F. R. Winne, formerly Treasurer.

Atchison, Topeka & Santa Fe.—The New York offices of Mr. J. W. Reinhart, President and Receiver, have been moved to 120 Broadway, New York.

Baltimore & Ohio.—Charles F. Mayer has been re-elected President of the company. This is Mr. Mayer's sixth consecutive election, having been first chosen by the directors in December, 1888, to succeed Samuel Spencer. Maj. Alexander Shaw was unanimously elected a director in place of the late George de B. Keim of Philadelphia.

Boston & Albany.—William H. Taft, of Boston, Division Master Mechanic, has been appointed Acting Superintendent of Motive Power, to succeed A. B. Underhill, who resigned on account of ill health.

Buffalo, Rochester & Pittsburgh.—The jurisdiction of R. G. Mathews, Superintendent of the Buffalo Division, has been extended over the Rochester Division, with office in Rochester, N. Y., vice T. H. Kirk, transferred to other duties.

Buffalo & Susquehanna.—M. E. Olmsted, President of the above railroad, is a resident of Harrisburg, Pa., not Scranton, as previously mentioned.

Columbus, Hocking Valley & Toledo.—C. B. Duffy, for three years past clerk to President C. C. Waite, has been appointed Purchasing Agent of the road.

Florida Midland.—Henry S. Chubb has been appointed Receiver, vice A. E. Drought, resigned.

Indiana, Illinois & Iowa.—T. M. Bates has resigned as Superintendent of the road, and he will be succeeded by Lewis H. Miller, who now fills the position of Master Mechanic. H. G. Rieves has been appointed Master Mechanic.

Kansas City, Fort Scott & Memphis.—J. D. Riddell has been appointed Assistant General Freight Agent of the company with office at Birmingham, Ala., vice C. W. Cheers, resigned.

Montana Central.—B. H. Langley has resigned as General Freight and Ticket Agent of the Montana Central. The office will be abolished and the duties performed by W. Harder, General Agent at Helena, and J. E. Dawson, General Agent at Butte.

Ottawa, Arnprior & Parry Sound.—The following appointments have been announced: M. Donaldson, Superintendent; C. J. Smith, General Freight and Passenger Agent; A. G. Peden, Auditor; A. W. Fleck, Assistant Treasurer, and J. Leslie, Roadmaster, of Ottawa.

Pennsylvania Lines West of Pittsburgh.—Edward B. Wall has been transferred to Pittsburgh, with the title of Assistant to the General Manager. The circular announcement of this change describes his duties as follows: He will have supervision for the purchase of articles in general use in every department of the company's service, and will be specially charged with the purchase of fuel, cross-ties and new equipment. In cases where, in his judgment, it would seem wise to make a modification of a requisition, either as to its character, quantity or quality, he shall communicate direct with the officer whose department the requisition originated, to the end that the question may be promptly adjusted. He will frequently visit the shops and other points on the lines where material is consumed, and all officers are directed to afford him full information in connection with the character, quantity and quality of supplies received. The Purchasing Agent will consult freely with him on all matters relating to his department.

H. O. Hukill has been appointed Purchasing Agent of these lines, to succeed William Mullins, deceased.

Philadelphia, Reading & New England.—E. M. Humstone has been appointed Master Mechanic, vice J. L. Ellis, resigned. John F. Hedden has been appointed Car Accountant. The office has been transferred from Philadelphia to Hartford, Conn.

Terre Haute & Indianapolis.—At the annual election of directors on Jan. 2 the following were elected: W. R. McKeen, John G. Williams, D. W. Minshall and H. Hulman, of this city; James N. McCrea, John E. Davidson and J. T. Brooks, of Pittsburgh. The last three are vice-presidents of the Pennsylvania company west of Pittsburgh. They are new members of the board.

Washington & Columbia River.—J. M. Winslow has been appointed Superintendent of Motive Power. The office of Master Mechanic, formerly held by William Saxon, has been abolished.

Wheeling & Lake Erie.—The following appointments have been made, to take effect from Jan. 1: L. Wildeson, Roadmaster of Western Division, with headquarters at Norwalk, O., vice D. McEntaffer, resigned; G. L. White, Roadmaster of Eastern Division, with headquarters at Massillon, O., vice L. Wildeson, transferred.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Baltimore & Ohio.—The grading of the new division of the Cleveland, Wooster & Muskingum Valley road from Wooster, O., to Millersburg, where connection is made with the Cleveland, Akron & Columbus road, has been completed some time, and arrangements have just been made to begin laying ties. When the work is done the Baltimore & Ohio will use the Cleveland, Akron & Columbus, Dresden branch, and the Cincinnati & Muskingum Valley to Zanesville, and the Zanesville & Ohio River road to the Ohio River, making a new route from Cleveland to the Ohio River.

Belva & Elk River.—This company was chartered in West Virginia last week, with a capital of $50,000. The proposed road will commence near Belva, Nicholas County, and extend thence to a point near the mouth of Blue Creek, on Elk River, in Kanawha County. The incorporators are: C. H. Eaton, of Charleston; E. A. Smith, S. N. Grammont, A. M. Williamson and F. J. Farley, of Providence, R. I. The principal office will be at Charleston, W. Va.

Bentonville, Fort Gibson & Southwestern.—This company filed articles of incorporation with the Secretary of State at Little Rock, Ark., last week. The incorporators and directors are: N. S. Henry, D. H. Wood, J. A. Rice, F. M. Bates, J. C. Knott and W. H. Cole, of Bentonville, Ark. The road will be 25 miles in length, from Bentonville to Fort Gibson.

Brownstown & Coal River.—President George Davis states that five miles of the line will be built as early as possible, and that the rails and ties for that part of the line have already been contracted for. The road is to connect with the Chesapeake & Ohio, and is to develop coal lands near the New River region and above the Kanawha Valley. The mines will be ready to ship coal as soon as the road can be completed.

Butte, Anaconda & Pacific.—This road, from Butte to Anaconda, Mont., a distance of 27½ miles, has been opened, and passenger trains have commenced running over the line. It is being operated by the Great Northern.

Central Pennsylvania & Western.—A mortgage for $5,000,000 has recently been recorded in various counties in Pennsylvania, in favor of the New York Security & Trust Company. The bonds secured by the mortgage are to be issued to provide for the construction of a line from Watsontown, the present terminus of the Wilkes Barre & Western to Wilkes Barre, Pa. This company was formed last year by the consolidation of the Wilkes Barre & Western, operating 30 miles of road between Orangeville and Watsontown, with the Orangeville & Lehigh and Turbotville & Williamsport, which have been incorporated to build extensions of the first named road. R. T. McCabe, of 29 Broadway, New York City, is President.

Chesapeake & Ohio.—This month the company expects to complete three tracks over almost the entire New River Valley, in West Virginia. The work begun on a new track on the south side of New River between Hawk's Nest and Thurmond early last spring has been continued without intermission, and the new line will be ready for traffic this month. There are already two tracks on the north side of New River all the way through the New River coalfields, and the completion of the new track on the southside opens up a field of coal almost as large as the one now operated. It will be remembered that early last spring engineers began the surveys of a new line from the mouth of Guyandotte River in West Virginia to a point 50 miles up that river. These lines were run, but the financial stringency caused the management to lay the results of the engineers' work aside for the time. At a recent meeting of the directory this work was ordered resumed, and the engineers went back onto the line again a few weeks ago.

Chicago, Paducah & Memphis.—Articles of incorporation have been filed in Illinois by this company. It is proposed to build a railroad from Altamont, Effingham County, to Metropolis, Massac County, Ill. The capital stock is $2,500,000, and the principal office at St. Louis. The incorporators and first Board of Directors are Benjamin F. Johnson, St. Elmo; John W. Griswold and John J. McLean, East St. Louis, Ill., and W. L. Huse and Joseph Dickson, St. Louis, Mo.

Cincinnati, Hamilton & Dayton.—Suit was filed in the Common Pleas Court last week by Thomas Emory's Sons, of Cincinnati, to have annulled the lease of the Cincinnati, Hamilton & Indianapolis, and to set aside the lease of the Indianapolis, Springfield & Decatur road.

Cincinnati, Union City & Chicago.—This project, on which nothing has been done for several months, has been revived. The contract for constructing it has been given to McNair & Barcey, of Chicago, who have just finished a branch of the Cleveland, Wooster & Muskinkum, and the line is to be completed by next August. The road will be built from Huntington to Union City, Ind., a distance of 80 miles, going through the gas and oil belt and passing the towns of Bluffton, Montpelier and Portland. J. C. Fawcett, of Louisville, is President.

Dry Fork.—Construction on this line is being pushed, and the grading force is kept at work continuously through the cold weather in the hope that the line may be ready for operation in the spring. The grading is already completed to Red Creek, within five miles of Harmon, W. Va., and the tracklaying will begin as soon as the grading is completed to the junction point, so that the rails and ties will be delivered by rail.

East Florida & Atlantic.—This road has been extended from Oviedo northward to Lake Charm, Fla., a distance of one mile, and is now operated by the Florida Central & Peninsular Railroad as a part of its line.

Florence, Cripple Creek & State Line.—Orman & Crook, of Pueblo, Col., who are building this railroad from Florence, Col., to the Cripple Creek mines, now have about 500 men employed near Florence and are constantly increasing that number. The first 12 miles of grading will be completed without much trouble and work has already been commenced on a 200-ft. tunnel at the end of this section.

A bridge gang is engaged in driving piles for the bridge to cross the Arkansas River at Florence. Jones & Seeley have the contract to supply 130,000 ties. The rails will be 40 lbs., to be supplied by the Bessemer Steel Works at Pueblo. The line is 39.8 miles long; the maximum grade 3.85 per cent. for a distance of a half mile below the camp of Victor, but the average grade is only two per cent.

Midland Terminal.—Clough & Davidson, the contractors who are building this line into Cripple Creek, Col., have their men distributed pretty well along the last miles from the town of Midland into Cripple Creek, and the work is making very fair progress. Most of this section consists of rockwork, and although work will probably be carried on through the winter it is not expected that the line will be ready for trains into Cripple Creek before July.

It is said that engineers began last week to make a survey from Cripple Creek to Canon City, which is the terminus of a branch of the Colorado Midland and is also on the Denver & Rio Grande. This line, if built, will paralell the Florence, Cripple Creek & State Line roads and it is not very probable that two lines will be built into the mines from the South.

Niagara Junction.—This road is now reported as being entirely completed. It is located in the city of Niagara Falls, on the lands owned by the Niagara Falls Power Co. and its auxiliary corporations, making connection with all the railroad lines. The Southwestern terminus connects with the main line of the New York Central; the Northeastern terminus connects with the Lockport branch of the New York Central. The total length of main line is six miles, and the length of sidings is three miles. By a siding to docks which have been built by the Cataract Construction Co., the line connects with the traffic by boat on the lakes. George B. Burbank, Chief Engineer of the Cataract Construction Co., is Chief Engineer of the railroad.

Northampton & Hertford.—The road is now about completed for the first nine miles from Gumberry, N. C. The line connects at Gumberry with the Seaboard Air Line, and extends south to Mowfield, N. C. (changed from Everett's), thence to Jackson, N. C., the present terminus, about nine miles. The construction work it is expected to complete in about two weeks, depending on the weather. The officers are: J. S. H. Clark, President, New York; A. L. Shepherd, Vice-President, Richmond, Va.; F. Kell, General Manager, Gumberry, N. C.; P. Meisel, Jr., Secretary and Treasurer, Gumberry, and G. H. Clark, Jr., Auditor, New York.

Nova Scotia Southern.—The route of this road is given as from Sand Point (Shelburne Harbor), via Jordan, Indian Gardens, Caledonian Corner, Brookfield, Pleasant River and Hemford to New Germany, the junction of the Nova Scotia Central, 76½ miles; a branch from Indian Gardens to Liverpool will be 19½ miles, the total road under contract to be completed Dec. 31 being 96 miles. There will be 13 bridges on the line of the road, the longest span being 150 ft. and the shortest 50 ft. The principal office is at Shelburne, N. S. R. G. Hervey, 15 Wall street, New York City, is President, and Alexander Mitchell, of Shelburne, N. S., is Chief Engineer.

Ohio Southern.—The first passenger train over the Lima extension of this road left Lima for the Wellston coal fields in southeastern Ohio Dec. 28.

Olean, Oswayo & Western.—This road, recently opened for operation, connects with the Wellsville, Coudersport & Pine Creek road at Genesee, Pa., and when completed will extend from Genesee, Pa., to Oswayo, Pa. At present the road is completed as far as Ellisburg, Pa., a distance of five miles, the entire length when finished will be 15 miles in length. Construction will be continued as soon as the weather will permit. The officers are as follows: President, J. B. Rumsey, Vice President, T. Cobb; Secretary, S. W. Crittenden, and Treasurer, F. C. Leonard, all of Oswayo, Pa.; General Freight and Passenger Agent, C. E. Davis, of Wellsville, N. Y.

Ottawa, Arnprior & Parry Sound.—Tracklaying for the winter has been completed on this line, building by the Canada Atlantic. The road now extends to Indian Point, 10 miles beyond Eganville, Ont., and over 80 miles from Ottawa, and passenger trains will shortly be running through to this point, which will be the terminus of the road for the winter. A temporary round house is being erected.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The company is making good progress on the extension of its New Cumberland branch on the West Virginia side of the Ohio River, and will have it completed to a point nearly opposite Wellsville, O., in a few days.

Pittsburgh Elevated.—This company has been chartered to build a line 10 miles long from Pittsburgh to Wilkinsburg Borough. The capital stock is $100,000. The Northside Elevated has also been incorporated, the directors of the two companies including the same names. John H. Dalzell, of Pittsburgh, is President, and Joshua Rhodes, W. B. Rhodes, G. B. Hill, J. D. Nicholson, R. S. Frazer and A. M. Neeper are the other directors.

Preemption Eastern.—Articles of incorporation of the company were filed in Illinois last week. It is proposed to build a railroad from a point on the line of the Rock Island & Mercer County Railroad, near the village of Preemption, Mercer County, to a point in that county. The capital stock is $50,000, and the principal office is to be in Rock Island. The incorporators are Robert Curtis, Robert Lee, Robt. H. Hundson, Hugh P. Greenough and Frank H. Rockwell, all of Rock Island, Ill.

San Pete Valley.—The line is now completed to Manti, Utah, and trains are running regularly. The Pacific Express will operate over the line. The extension just completed adds 17 miles to the line, making a total mileage from Nephi of 44 miles. The cost of the extension was $250,000.

Southern Pacific.—The company has been considering a proposition to build an extension into the Yosemite Valley. The proposed branch will start from a point a little south of Modesto, Cal., cross the Oakdale branch, near Montpelier, and thence proceed up the valley. It will be 90 miles long. The preliminary survey has been made.

State Line.—The opening of this line for through traffic has been delayed for many months by the work on the bridge across the Cheat River at Port Marion, Pa., near the West Virginia State line. The erecting work is now being pushed with an extra force, and as the track on the new road has been built to the bridge structure from both ends, trains will commence running as soon as it is ready for traffic. The road is a branch of the Baltimore & Ohio, about 22 miles long, from Smithfield to Uniontown and to Morgantown, W. Va.

Toledo & Maunee Valley.—Incorporation papers have been filed by this company at Columbus, O., to build a railroad to be operated by electricity or other motive power, from Toledo to Perrysburg, Wood County. The capital stock is $300,000.

GENERAL RAILROAD NEWS.

Bristol, Elizabethton & North Carolina.—Benjamin L. Dulaney, of Bristol, Tenn., and Frederick M. Leonard, of Philadelphia, Pa., have been appointed Receivers of this company.

Central Pacific.—C. P. Huntington announced last week that there has been a modification of the lease of the Central Pacific to the Southern Pacific. The original lease, made in 1885, contained a provision that if it appeared at any time that the operation of the lease was benefiting one party at the expense of the other, it should be revised so that such should not be the operation. Mr. Huntington says that the operation of the last eight years has shown that the Central Pacific has gained at the expense of the Southern Pacific, the former earning the guaranteed rental only once during that time. This lease has now been revised so that Central Pacific will be entitled to all of its earnings up to six per cent. on the stock, after which any excess is to

be divided equally between Central Pacific and Southern Pacific. The original lease provided that the Southern Pacific should pay to the Central Pacific an annual rental of $1,200,000 and the excess of net earnings after deducting certain stipulated charges up to $2,400,000. The terms were modified on Jan. 1, 1888, after the capital stock of the Central Pacific was increased to $68,000,000 to complete the Oregon & California extension, and the minimum rental was advanced to $1,360,000 and the maximum to $4,080,000.

Chesapeake, Ohio & Southwestern.—In the United States Circuit Court at Clarksville, Tenn., Judge Lurton, on Dec. 28, appointed Gen. John Echols and St. John Boyle Receivers for this railroad. The application was made by C. P. Huntington, and was resisted by the attorneys for the Commonwealth of Kentucky. Gen. Echols is the Vice-President of the Chesapeake, Ohio & Southwestern, and St. John Boyle is a well-known corporation lawyer of Louisville, and was suggested as a Receiver by the attorneys for the state. The road will probably be sold at foreclosure by order of the Court, and the Louisville & Nashville has announced that it will be a bidder.

A deed of transfer of the railroad from C. P. Huntington to the Illinois Central was filed for record at Louisville, Ky., on Jan. 2, also a mortgage for five millions from the Illinois Central to the United States Trust Co., of New York City.

Chicago, Burlington & Quincy.—The following table gives the earnings and expenses of the road for the month of November, and for the 11 months of the fiscal year.

Month of Nov.	1893.	1892.	Inc. or dec.
Gross earn	$3,094,533	$3,522,902	D. $428,368
Oper. expen. and taxes	1,678,888	2,151,581	D. 472,692
Net earn	$1,415,645	$1,371,321	I. $44,324
Charges	830,000	815,075	I. 14,924
Surplus	$585,645	$556,246	I. $29,400
11 *Months to Nov. 30.*			
Gross earn	$35,460,252	$36,868,812	D. $1,407,873
Operating expens	22,787,903	23 943,284	D. 1,155,331
Net earn	$12,672,349	$12.925,528	D. $252,492
Charges	9,130,000	8,965,825	I. 164,174
Surplus	$3,542,349	$3,959,703	D. $416,666

Gulf, Colorado & Santa Fe.—Vice-President Sealey and General Manager Yoakum issued a statement on Dec. 25, stating that the appointment of receivers for the Atchison, Topeka & Santa Fe would not affect the above line, its property not being included in the proceedings. The controlling interest in stock is owned by the Atchison, Topeka & Santa Fe, but the company would continue to operate its own line irrespective of the receivership and would not default on any of its obligations.

Kansas City & Northwestern.—The reorganization of the Kansas City, Wyandotte & Northwestern Railroad is to be carried out immediately, and with this end in view a new company has been formed and its charter filed in Kansas, under the above name. The plan is to purchase the property of the Kansas City, Wyandotte & Northwestern Railroad, which is to be sold on Jan. 5. The directors are George J. Gould, C. G. Warner, W. B. Doddridge, F. W. Ireland, B. P. Waggoner, W. P. Waggoner, David Kelso and C. M. Rathbun, all connected with the Missouri Pacific.

New York, Lake Erie & Western.—The plan for the reorganization of the company was announced this week. The directors explain that the terms and peculiar conditions of the second consolidated mortgage have precluded the company from securing necessary funds by any other mortgage security, and that the floating debt has been constantly increasing for some years past; now it amounts to nearly $9,000,000, exclusive of $6,000,000 of Car Trust obligations. The provision in the second mortgage that foreclosure rights should accrue only after default in the payment of six successive coupons has deprived the bonds issued thereunder of the market character to which they would be entitled under ordinary circumstances. It is proposed now to issue a blanket mortgage of $70,000,000 having 100 years to run, bearing five per cent. interest, into which other bonds may be exchanged. The new mortgage will require prompt payment of interest and give adequate foreclosure rights. The directors say that such a mortgage will not increase at present the fixed charges of the company, and will therefore be well within the earning capacity of the property, if its legitimate requirements are fairly provided for. The new mortgage will cover the property of the New York, Lake Erie & Western Railroad Company, including its leasehold of the New York, Pennsylvania & Ohio and the capital stock of the Chicago & Erie Railroad, thus giving it control of the entire line to Chicago. Drexel, Morgan & Co. will receive deposits of the old bonds for exchange into the new consolidated bonds.

The earnings and expenses of this company for the month of November are given in the following table:

	1893.	1892.	Dec.
Gross earnings	$2,396,372	$2,583,143	$186.771
Operating expen	1,641.911	1,688.572	46.661
Balance	$754,461	$894.571	$140,110
Due to leased lines	218.918	233,715	14,797
Net earn	$535,543	$660,856	$125,313

The gross earnings for the two months of the fiscal year were $5,118,490, a decrease of $223,245; the net earnings, less the rentals, were $1,149,502, a decrease of $120,925.

New York & New England.—The affairs of this company have been further complicated by the appointment of separate receivers, representing various interests in the various states in which the company's property is located. The original bill for the appointment of a Receiver was filed in the United States Court at Albany, N. Y., on Dec. 27, and under it Thomas C. Platt, a director of the company and President of the United States Express Co., which owns 8,000 shares of stock, was appointed temporary Receiver. The argument for the appointment of a permanent Receiver will be heard on Jan. 10. The same week Judge Townsend, of the United States Court at New Haven, appointed W. T. Hart, a former President of the railroad, and now representing the second mortgage bondholders, Receiver for Connecticut. Judge Colt, at Boston, has appointed Mr. Platt and Mr. Hart and a third receiver Marsden J. Perry, to act as receivers for Massachusetts and Rhode Island, so that the conflicting interests shall have representation. President McLeod expresses himself confident that at the hearings to confirm these appointments he will be able to secure orders to vacate each of the appointments. The principal suit is that in which Mr. Platt was appointed Receiver. It is charged in the complaint that the company is insolvent. Its floating debt is said to be over $2,600,000 at present; earnings which should have been used for improvements and rolling stock have been used to pay dividends; the last semi-annual interest was paid with borrowed money, and the company is without funds to pay the interest due Jan. 1, amounting to $330,000. It is also charged that the published reports have not shown accurately the financial condition of the company. This is the third receivership of the company. In 1873 the old Boston, Hartford & Erie was placed under the protection of the courts, and again in 1884, a receiver, C. P. Clark, was in charge of the company.

The annual meeting was held in New York on Wednesday, Dec. 27, the principal business before the stockholders being the voting on the ratification of the lease of the New York, New England & Northern, the company organized by President McLeod to secure for the New England road an entrance into New York. There were 108,750 shares cast in favor of ratification and 6,983 against, but about 9,000 votes were still lacking to make the necessary vote in favor of ratification. An adjournment was therefore taken until Thursday, when a majority in favor of the lease was secured. The total vote was 141,029 shares, 134,046 shares being voted in favor of the lease. This vote was not completed until after the appointment of Mr. Platt as Receiver, and its validity will be attacked.

New York & Northern.—The road was sold at auction at Yonkers, N. Y., on Dec. 28, and bought by J. Pierpont Morgan in the interest of the New York Central & Hudson River Railroad Company for $1,000,000. The sale was in the foreclosure suit brought by the Farmers' Loan & Trust Co., trustee of the second mortgage bonds, a majority of which are controlled by the New York Central Railroad. The minority stockholders have opposed this foreclosure, which is a step in the reorganization of the company by the New York Central Railroad.

Northern Pacific.—Application was made to United States Circuit Court, in Milwaukee, on Dec. 28, by Silas W. Pettit, of Philadelphia, General Counsel of the railroad company, for the removal of the present Receivers, Thomas F Oakes, Henry C. Payne and Henry C. Rouse, and for the appointment of other receivers in their place. The petition is signed by Vice-President Harris, and sets forth allegations on the part of the Northern Pacific directors similar to those made in the suit brought by John Swope against Henry Villard and his associates earlier in the year. As Thomas F. Oakes was one of the directors at the time the alleged causes of the action occurred, it is argued that he is not a proper person to be a receiver, especially as suits for recovery by the stockholders must be brought by the Receivers. Charges are made that Roswell G. Rolston, as chairman of the Finance Committee, joined President Oakes in use of consolidated mortgage bonds for purposes not allowed by the terms of the mortgage, of which the Farmers' Loan & Trust Co. is trustee. The charge that the old directors voted to have the Northern Pacific assume financial obligations of other companies in which they were interested is repeated. It is charged that separate receivers have been unnecessarily appointed for branch lines, and that the expenses of administering the affairs of the company have been enormously increased. This suit was brought in accordance with a resolution passed at the directors' meeting in November, requesting Mr. Oakes' resignation as receiver and directing that legal steps be taken to remove him in case of his refusal. No charges are made against Receivers Rouse and Payne. Messrs. Oakes and Rolston have denied the charges made against them in the petition.

Ohio Valley.—John McLeod, of Louisville, has been appointed Receiver of this road, which has been operated for several months by the Newport News & Mississippi Valley Company. The road extends from Evansville to Hopkinsville, Ky., 130 miles. The application for a Receivership was made in the interest of the lessee company. Receivers have been recently appointed for that road, and Judge Barr, of the United States Court at Louisville, who has jurisdiction, was asked to appoint the same Receivers, General Echols and St. John Boyle, for the subsidiary road. That suggestion, however, he failed to act upon.

Pennsylvania.—The statement of earnings of Eastern lines for November is given below:

	1893.	1892.	Dec.
Gross earn	$5,288,153	$6,017,283	$729,130
Oper. expenses	3,591,291	4,123,179	531.887
Net earn	$1,696,862	$1,894,104	$197,242

Net earnings in 1891 were $1,930,874; in 1890, $2,136,635, and in 1889, $1,734,809.

The Western lines for November show a gross decrease of $637,893, and a net decrease of $384,322. The system for November shows a gross decrease of $1,367,023, and a net decrease of $578,564.

Eastern lines for 11 *months:*

	1893.	1892.	Dec.
Gross earn	$61,072,369	$62,906,911	$1,834,542
Oper. expenses	43,408,319	44,415,106	1,006,787
Net earn	$17,664,050	$18,491,805	$827,755

Net earnings in 1891 were $19,916,684; in 1890, $19,625,591, and in 1889, $18,753,399. Western lines for 11 months show a gross decrease of $604,330, and a net decrease of $149,606. The system for 11 months shows a gross decrease of $2,438,872, and a net decrease of $977,361.

Terre Haute & Indianapolis.—The Pennsylvania Co. has secured a dominant influence in the direction of this company, at the annual meeting this week. Vice-Presidents McCrea, Davidson and Brooks were elected directors. President McKeen says that he has sold part of his holdings of stock, and that the road will be under the direct control of the Pennsylvania. The Terre Haute and Indianapolis is the lessor of the Terre Haute & Logansport, the St. Louis, Vandalia & Terre Haute, which is the Western Division of the Vandalia proper, and the Terre Haute & Peoria.

Texas Midland.—President E. H. R. Green has announced the confirmation of the contract for the extension of the road into Ennis from the present terminus at Garrett. The branch is not 10 miles long.

Western New York & Pennsylvania.—The company has abondoned the road between Brocton and Corry, Pa., pending the reconstruction of the trestles between Brocton and Sherman. Through trains now run from Brocton the Lake Shore & Michigan Southern tracks to Erie and thence via the Philadelphia & Erie to Corry.

TRAFFIC.

Traffic Notes.

The Big Four has discontinued through passenger trains between Louisville and Chicago.

The New York Central has made reductions in monthly tickets between Buffalo and stations on the main line near that city.

One of the first fruits of the new passenger agreement among the transcontinental lines is a notice issued by the Northern Pacific that tickets of Great Northern issue will be accepted one way over Northern Pacific lines.

The National Despatch (Central Vermont) Fast Freight Line has followed the announcement of the Erie by a reduction in rates to all Western points to the basis of 55, 49, 38, 27, 24 and 20 cents per 100 lbs., New York to Chicago.

The Michigan Central has resumed relations with the "Soo" line, which have been interrupted since February, 1892, owing to the making of rates by the "Soo" over the Michigan Central, which diverted freight from Chicago, and caused the Chicago lines to complain.

The California Traffic Association is having hard work to support the North American Navigation Company, the line of vessels which it had established to connect with the Panama Railroad and thus make a competing line so as to keep freight rates over the Transcontinental railroads low. Commissioner Leeds lately issued a circular stating that $30,000 was needed at once.

It is announced, apparently with the approval of the officers of the Trunk Line Association, that the Erie will accept westbound freight on the basis of a differential double that previously existing. The differentials heretofore allowed that road below the 75 cent basis, New York to Chicago, have been 5, 4, 3, 2, 1 and 1 on classes 1, 2, 3, 4, 5 and 6. Now they are 10, 8, 6, 4, 2 and 2 respectively. The agreement made in 1889 provides that "if the maintenance of uniform tariffs by all lines reduces the traffic of any party below a fair proportion, the tariffs may be adjusted from time to time. . . ." During the last six or eight weeks the Erie has not received what Chairman Goddard has considered a fair proportion of the westbound traffic from New York City; hence this adjustment.

Chicago Traffic Matters.

CHICAGO, Jan. 3, 1894.

Western officials of Eastern roads profess to believe that eastbound rates will now be maintained on the basis of restoration agreed upon, and that some satisfactory scheme will be evolved for an equitable division of the business which shall remove the incentive to cut the rates. It is certain, however, that until some arrangement of the kind is put into practical operation the periodical farce of a "restoration" will need to be gone through with about as before. The last meeting of presidents again passed resolutions that "the commissioners, in conjunction with the freight officers of the joint committee lines, proceed to formulate an agreement looking to divisions of eastbound traffic and monthly payments in equalization of balances," and report at a subsequent meeting; also to enter into some arrangements by which uniform export rates shall be quoted via all ports. As it is well known among all the interested parties that at least one line flatly refuses to become a party to settlements by balances—in other words, to the formation of a pool—while the law remains as it now is, the futility of these resolutions is such as to provoke a smile. The same thing was "recommended" a year ago, and the Commissioners attempted to carry it into effect, but without success. It taxes one's credulity considerably to be asked to believe that there has been any change which warrants the belief that they will be any more successful now. In the meanwhile the other roads are met by the frank admission (doubtless forced by an attempt to "bottle up" the road in an agreement), made by the president of the Lake Shore that he has been meeting, and proposes to continue to meet, any secret cuts made by his competitors that come to his knowledge. President Newell is quoted as saying that he implicitly obeyed the provisions of the Interstate Commerce law up to September, 1892. During that time he found that it afforded his line no protection; that the Lake Shore was losing all its business owing to secret cuts made by the other lines. At that time he gave instructions to his subordinates not to initiate any reductions, but to follow any that were made and get the business.

The "Soo" line is reported to have given the other roads assurances that it will restore its tariffs on Jan. 5 "if satisfied that the other lines are carrying out their agreements."

There is little or no change in the Eastern passenger situation, nor is there likely to be prior to the meeting called for next week.

The Chairman of the Western Passenger Association having decided that the case involved in the complaint of the Santa Fe against the Rock Island for paying street commissions, which was thrown out by the local association, was regularly before him for decision, the Rock Island has appealed to arbitration.

More trouble is brewing in Ohio River territory. Now it is the Ohio & Mississippi which threatens to discipline the Big Four unless the latter stops making secret cuts in passenger rates between Cincinnati and Louisville.

It is now said that the Canadian Pacific is endeavoring to bluff the other lines into granting its demand for a $10 differential on north Pacific Coast business by quoting a differential of $20 prior to the meeting to be held for the adjusting of rates.

The Rock Island has terminated its traffic arrangement with the Sioux City & Northern.

The Chairman of the Western Passenger Association took the Toledo, St. Louis & Kansas City to task for furnishing Kansas City brokers with large blocks of tickets, which cut the rates between Kansas City and Chicago and Kansas City and St. Louis. That line promptly agreed to clear the market of the tickets, and no further action has yet been taken by the Association.

The general offices of the Chicago & Eastern Illinois have been removed from the First National Bank building to the Ellsworth building, 355 Dearborn street.

Members of the Western Passenger Association have voted adversely on a proposition to require connecting roads to indorse on exchange orders the amount received for them.

The through sleeping cars between Chicago and North Pacific Coast points over the Chicago, Milwaukee & St. Paul and the Great Northern have been withdrawn for lack of patronage.

(*Other Chicago traffic news will be found on page* 9.)